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MACHINERY

VOLUME 57 **DECEMBER, 1950** NUMBER 4

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

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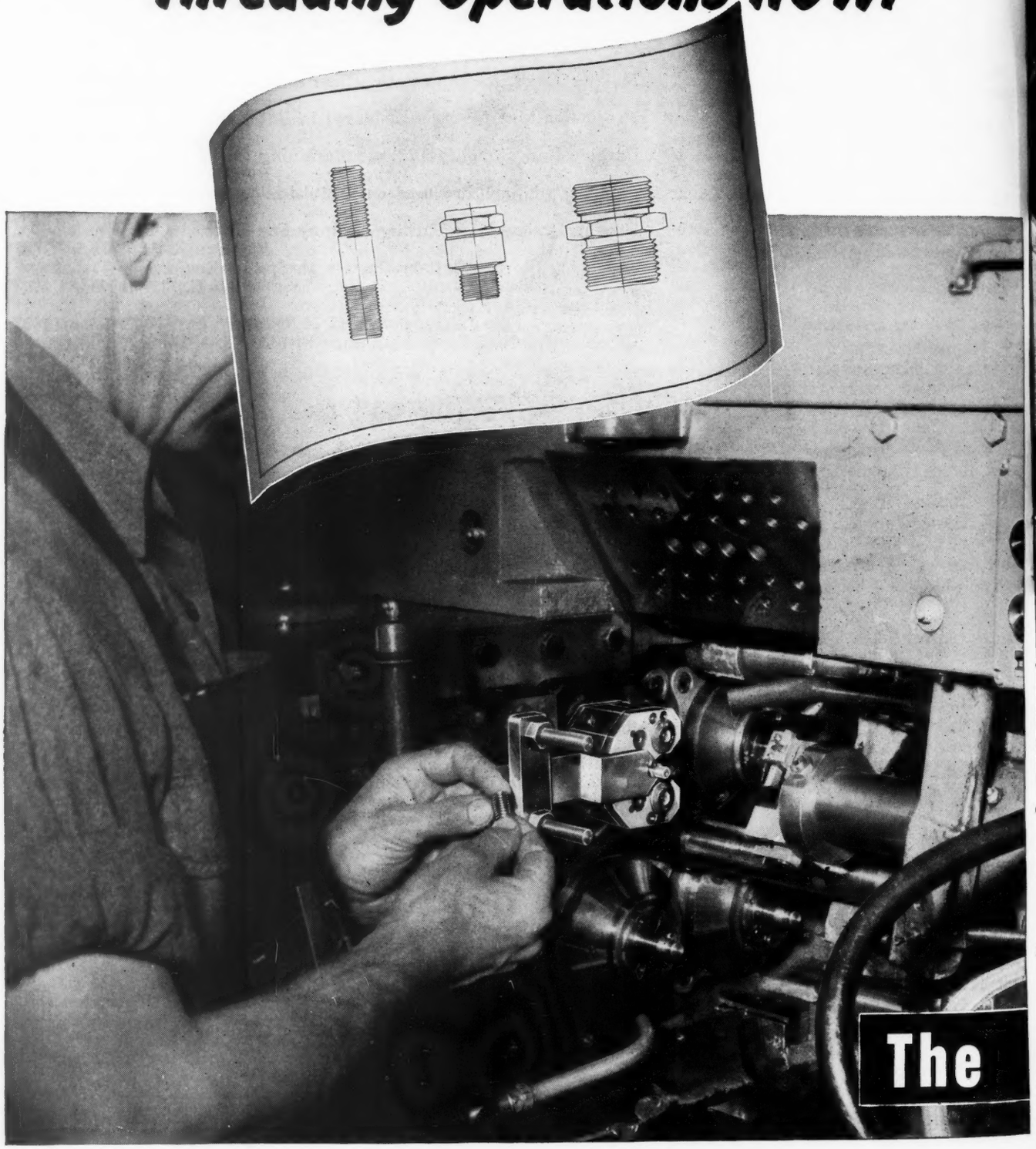

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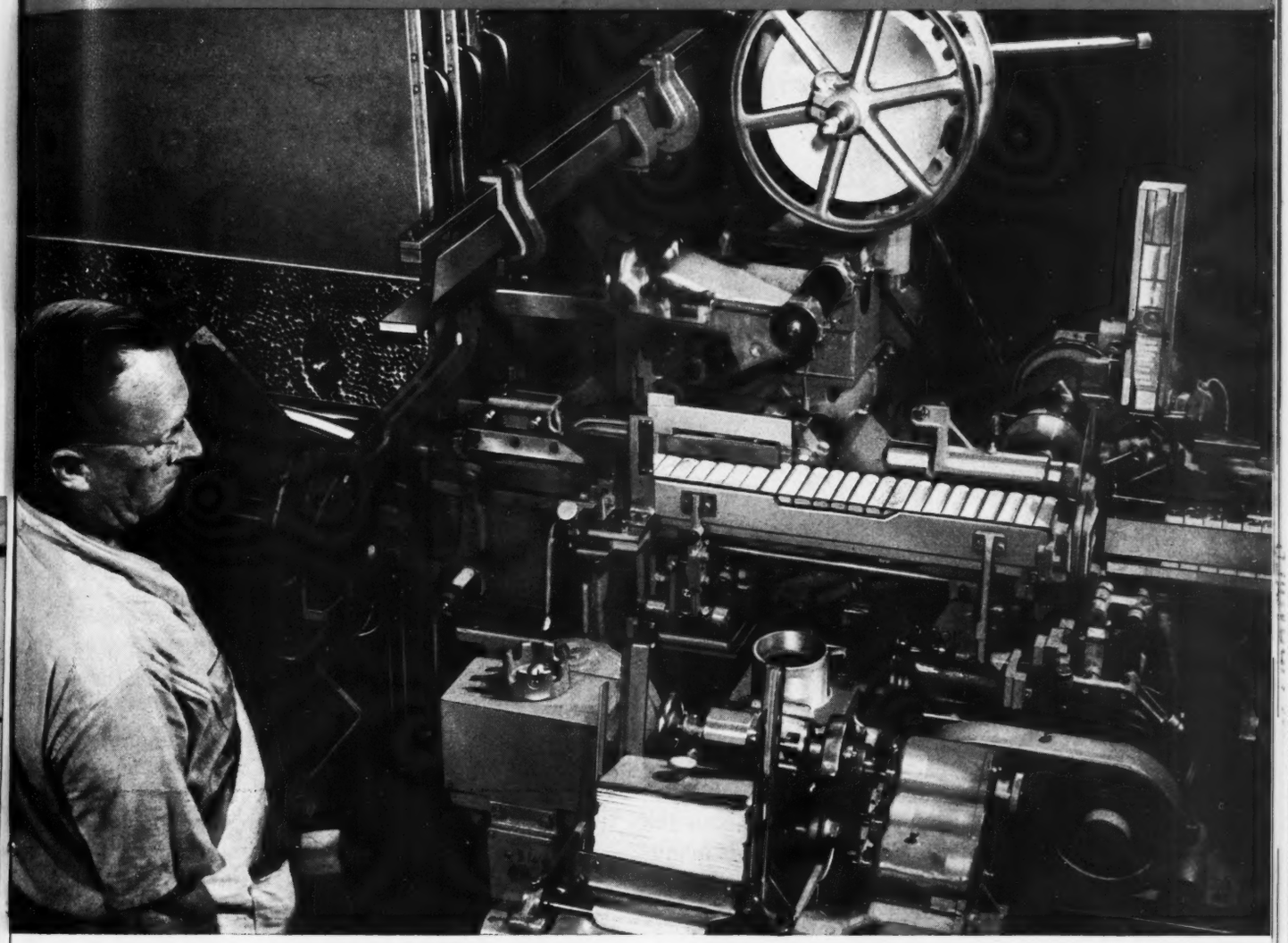


Making Cams for Automatic Cigar and Cigarette Machinery

By R. F. V. STANTON
Vice-President in Charge of Manufacturing
American Machine & Foundry Co.
Brooklyn, N. Y.

AUTOMATIC machines, which are made up of complicated mechanisms, require the use of many different types of cams to actuate and time their movements. The exact timing requirements of mechanisms in automatic cigar and cigarette processing machines necessitate carefully developed and accurately made cams. This article will describe the methods and special equipment employed in making cams for machines of this type at the plant of the American Machine & Foundry Co. in Brooklyn, N. Y.

The two most important types of cams used in the cigarette and cigar machines shown in the

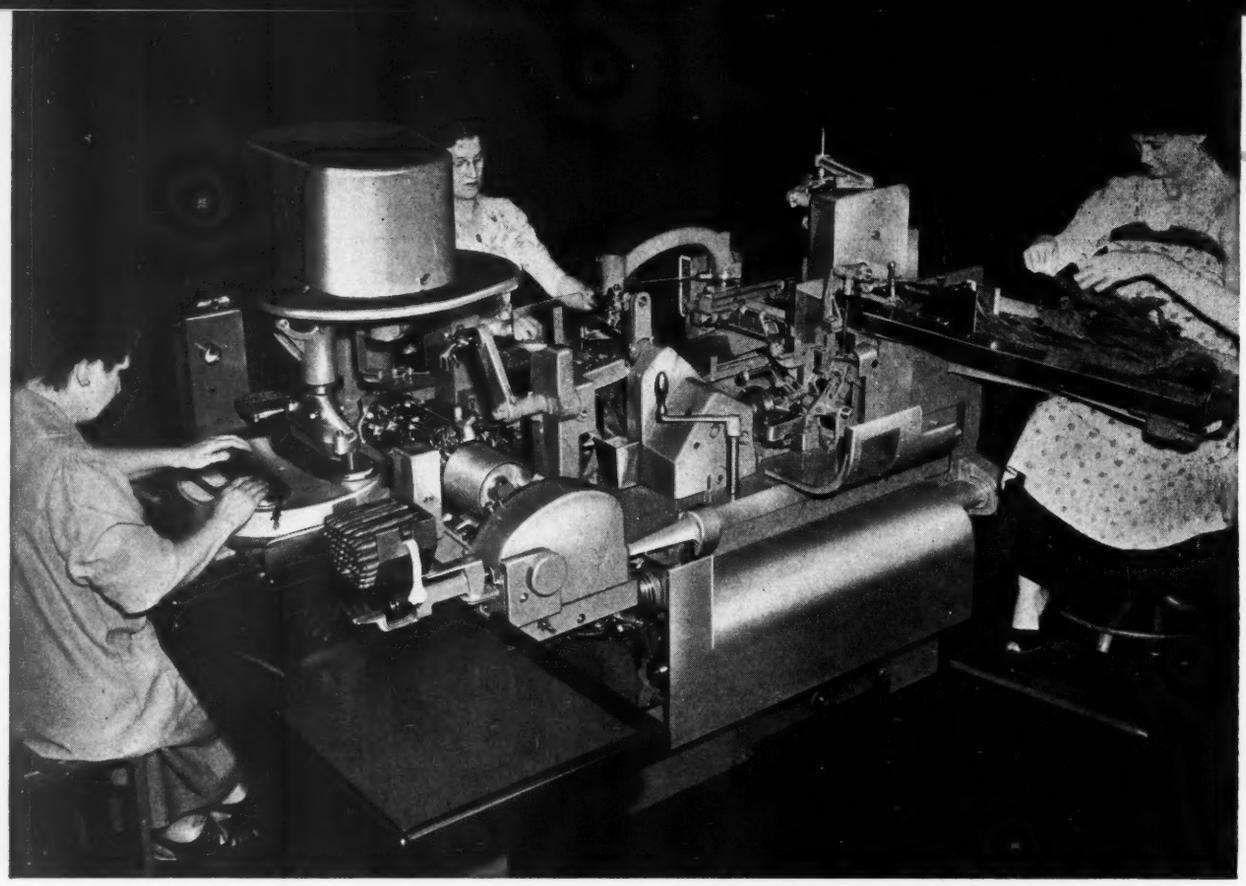


Fig. 1. Cigar making machine in which cams are employed to actuate and time the movements of the complicated mechanisms that automatically roll the cigars

heading illustration and Fig. 1, respectively, are face and cylinder cams. These differ in that the path or track of the face cam lies in one plane, while the track of the cylinder cam lies on the curved surface of a cylinder or drum. The manufacture and use of these two types of cams will be explained in subsequent paragraphs.

The precise timing of cam-operated mechanisms is illustrated by the action of the compressor turret in a cigarette packaging machine. The drum cam illustrated in Fig. 3 is responsible for the intermittent movement of this turret. An intermittent motion is required to allow hopper-fed cigarettes to be inserted, twenty at a time, 150 times a minute into pockets in the twelve-station indexing turret while the turret is stopped. The cam provides the starting and stopping motion. This drum cam is made from alloy-steel

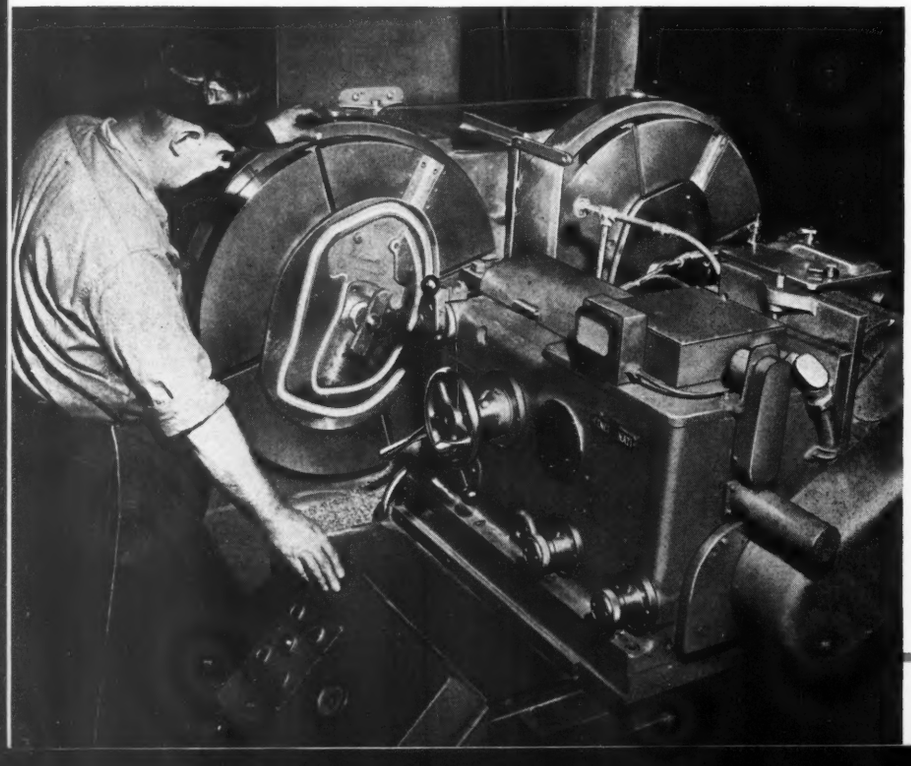


Fig. 2. Face cams are produced in special machines having two 32-inch diameter vertical faceplates, one of which holds the work and the other a master cam

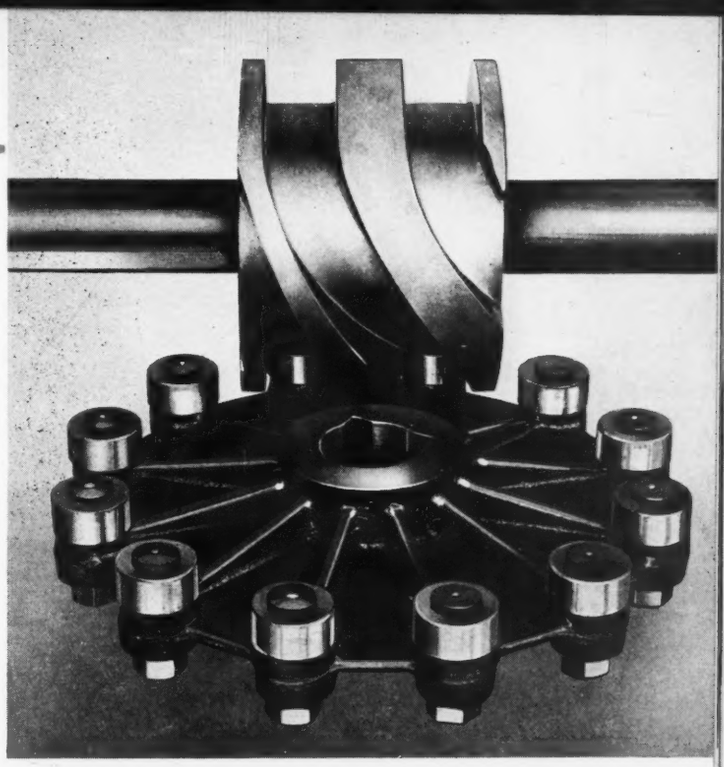


Fig. 3. Drum cam used in cigarette packaging machine to index and actuate the compressor turret. Twelve roller followers are used with this cam to operate connected mechanisms

blanks (AISI-A8617) which are drilled, bored, keyed, and turned before the cam surface is milled.

The first step in preparing to mill the cam track is to scribe a lay-out of the developed shape of the track on a piece of thin sheet brass or other suitable metal. To avoid excessive noise, shock, or wear of the mechanism, the curved portions of the track are laid out as a "crank" or "harmonic" curve, which provides a uniformly accelerated follower motion.

The next step is to transfer the developed lay-out to an intermediate master cam. This cam is usually cut from heavier brass sheet, approximately 1/4 inch thick, and, as the cam must rotate 720 degrees for one complete follower movement, more than one disk is required. Three such superimposed disks can be seen mounted on the right-hand faceplate of the master cam milling machine in Fig. 4. In order to minimize irregularities, the disks are made two or three times the actual size of the finished cam.

Using the intermediate master cam as a templet, a working master cam is next made. The working cam is shown mounted on the left-hand faceplate of the machine in Fig. 4. In cutting this master cam, a tracer roller follows the contour of the templet, causing the cutter-spindle to move similarly, so that the required groove is cut in the master cam. Both faceplates rotate in the same direction and at the same speed. The tracer roller and cutter are of the same diameter as the follower roller used in cutting the drum cam.

The master cam is now employed in cutting the drum-cam tracks. This is done on the machine shown in Fig. 5, which was specially developed by the American Machine & Foundry Co. for this purpose. The master cam and drum cam rotate at the same speed on axes perpendicular to each other. The master cam actuates the vertical slide on which the cutter-spindle is mounted, producing an accurate cam track in the cylinder.

One additional motion is necessary in cutting this particular drum cam, as the follower is mounted on an arm 5 1/2 inches long and travels on the circumference of an 11-inch diameter

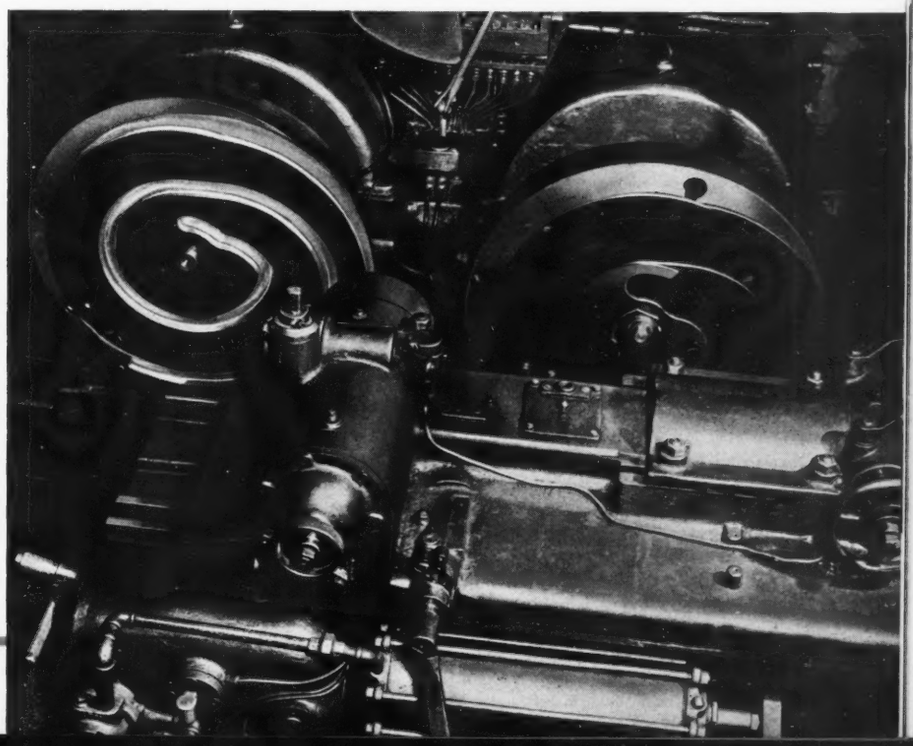


Fig. 4. Working master cams used in milling drum cams are cut in this machine, which employs a templet laid out on three superimposed brass sheets, as seen at the right

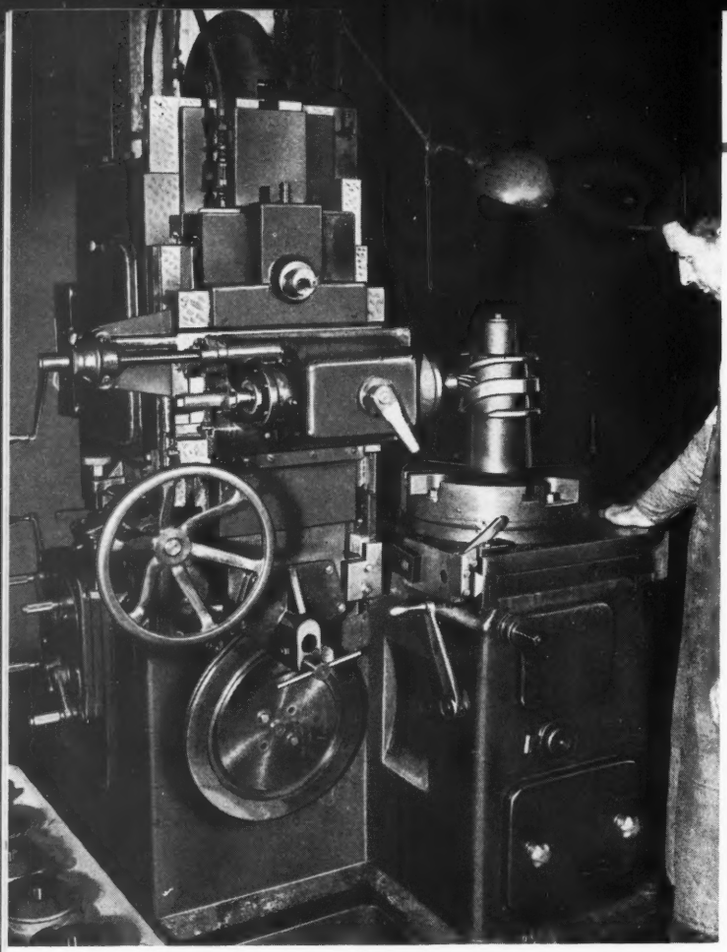


Fig. 5. Special machine in which the working master cam is used to actuate a vertical cutter-slide for milling drum cams

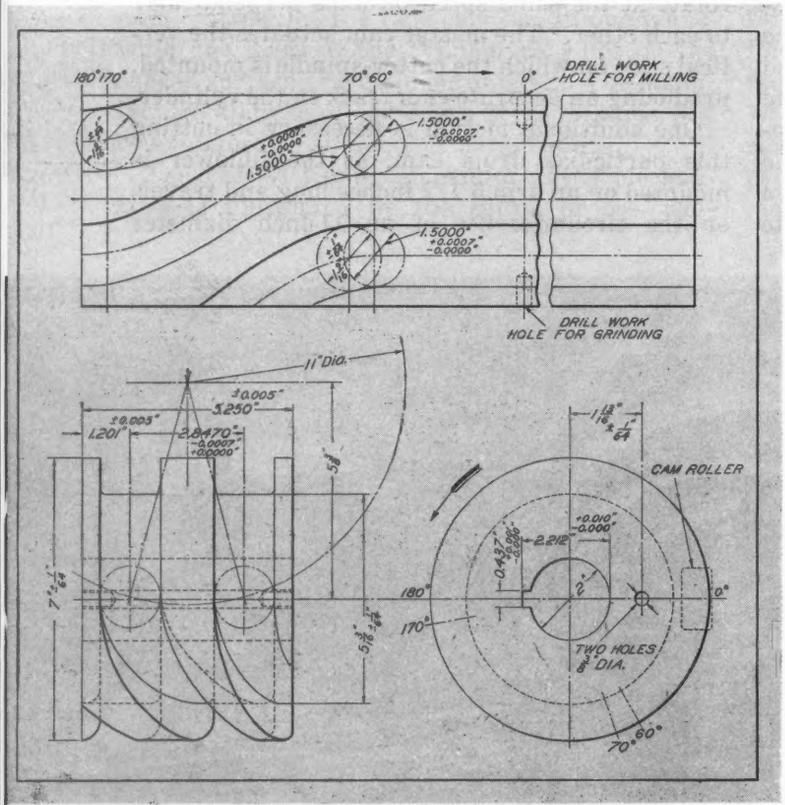


Fig. 6. Detailed drawing of a drum cam milled in the special machine seen in Fig. 5

circle. Because of this, the center of the follower roller does not remain on the center line of the drum during its contact with the cam (Fig. 6). Therefore, it will be seen that when the cam is cut, the cutter-spindle must also move off the center line of the drum.

This motion of the cutter-spindle is obtained by the use of a 5 1/2-inch link between the vertical slide and the table on which the drum revolves. A horizontal sliding movement is thus imparted to the table. As the vertical slide and cutter move in a straight line upward from *B* to *T* (Fig. 7), the link causes the table (or horizontal slide) to be moved from *X* to *Y* and back to *X*. This is equivalent to having the cutter describe an arc of 5 1/2 inches radius in moving from bottom to top and maintains the same relative position between the cutter and the work as exists between the roller and the cam in actual operation. This is necessary in order to keep a full bearing of the roller against the cam track.

To form the required track, three milling cuts are taken, leaving 0.012 inch of stock for grinding after hardening. Experience has shown this to be the proper allowance to compensate for distortion in hardening.

A 1 7/16-inch diameter high-speed steel spiral end-mill is used for the first cut, with a rotary speed of approximately 400 R.P.M. and a depth of cut of 5/16 inch. This is followed by a semi-finishing cut with a 1 15/32-inch diameter cutter, and by a finishing cut with a 1 1/2-inch diameter cutter.

After the track has been milled, it is checked on the fixture shown in Fig. 9, which duplicates the conditions under which the cam operates in actual use. This particular cam requires a link 5 1/2 inches long in the fixture.

Since cam tracks are subjected to great wear in high-speed machines, it is necessary that they be hardened and ground. The drum cam is carburized 3/64 inch deep to a hardness of 55 to 60 Rockwell C. After hardening, it is ground to within 0.0005 inch on a machine similar to that shown in Fig. 5, with a grinding spindle replacing the cutter-spindle (Fig. 8). Wheel speeds approximating 12,000 R.P.M. have produced the best results with the cam hardened as speci-

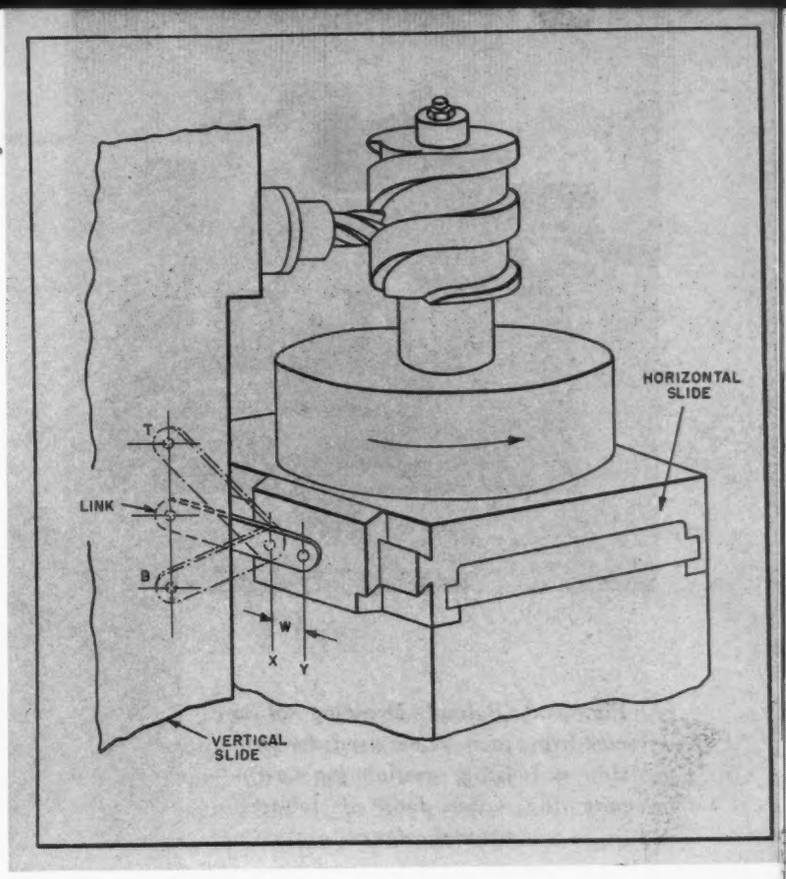


Fig. 7. Detail view of cam milling machine showing link used to produce off-center movement between cutter and cam

fied. The cam track is then checked again, using the same fixture and the 5 1/2-inch link. The roller, however, is changed to suit the track width as ground.

Face cams, as mentioned, are also used extensively in the type of machines referred to. An example of a typical face cam is shown in Fig. 10. This particular cam is used on a cigar making machine to provide the motion required for wrapping the outer leaf of tobacco around the cigar. Templets and master cams are made in the same way as described for the cylinder cams.

The cam illustrated is produced on a special machine designed and built to the company's specifications. This machine, Fig. 2, has two 32-inch diameter vertical faceplates which rotate in the same direction and at the same speed. One of the faceplates holds the work, while the other holds the master cam. A tracer follows the master cam and actuates the cutter-spindle. The feed of this machine is maintained at a constant rate by automatically varying the rotation of the faceplates. This increases the rotational speed when the cutter is operating near the center of the cam, and decreases the rotational speed when the cutter is at the outer edges of the cam.

The first of three cuts taken on the outer track is a roughing cut with a 7/8-inch diameter high-speed steel spiral end-mill operating at 250 R.P.M. with a feed of 7 1/2 inches per minute. A semi-finishing cut follows, using a 31/32-inch diameter high-speed steel cutter at the same speed and feed. This, in turn, is followed by a finishing cut with a four-fluted 1-inch diameter carbide-tipped cutter operating at 500 R.P.M. and at the same feed rate as in the other two cuts.

The same general procedure is followed for the inner cam track, using cutters of different sizes and a different master cam. Approximately 1 1/4 hours is required for milling both of these tracks on each cam. A grinding attachment, de-

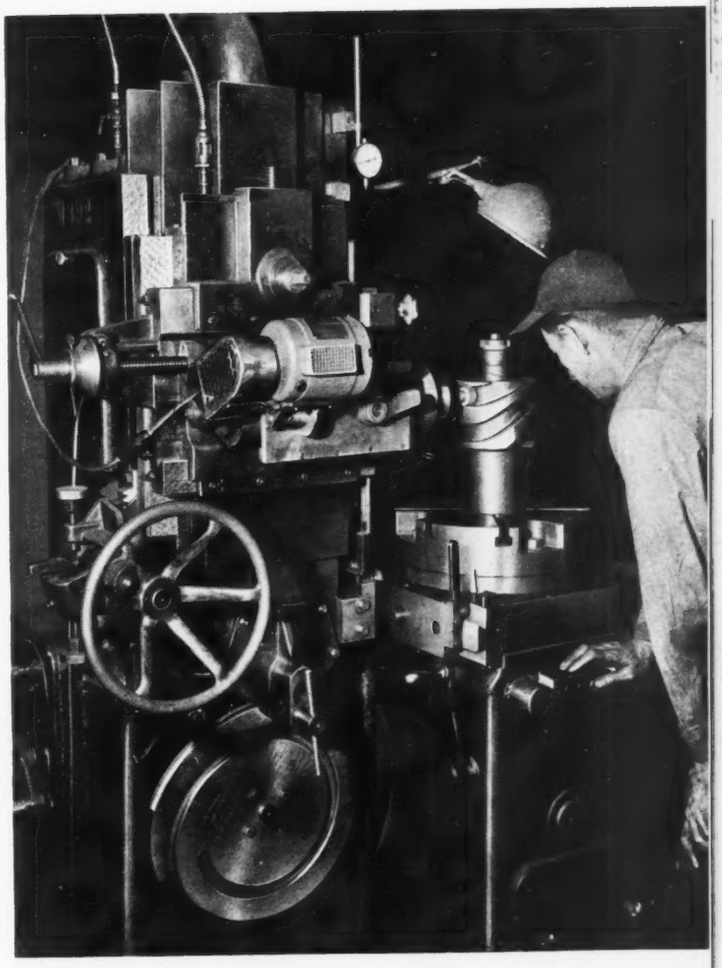


Fig. 8. Special machine similar to one illustrated in Fig. 5, in which a grinding spindle replaces the cutter-spindle

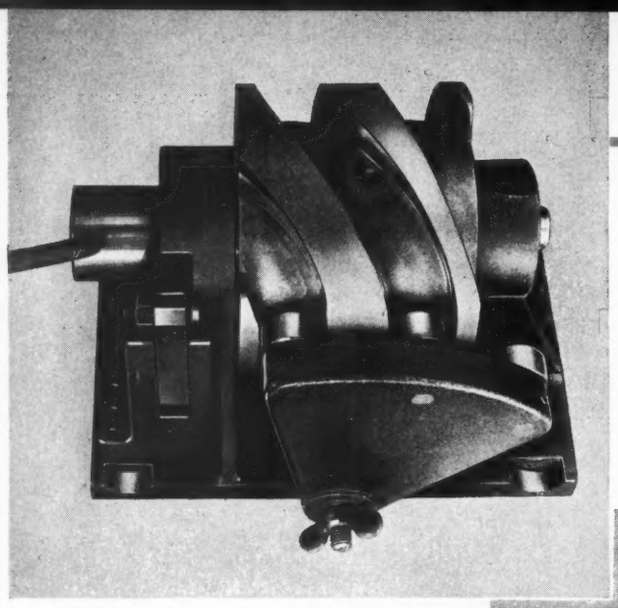


Fig. 9. (Left) Fixture used in checking drum cam, which duplicates actual working conditions

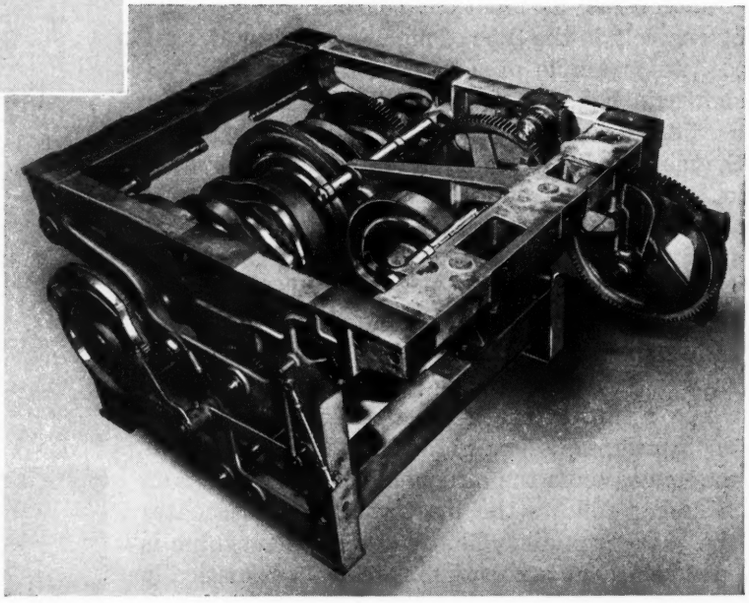
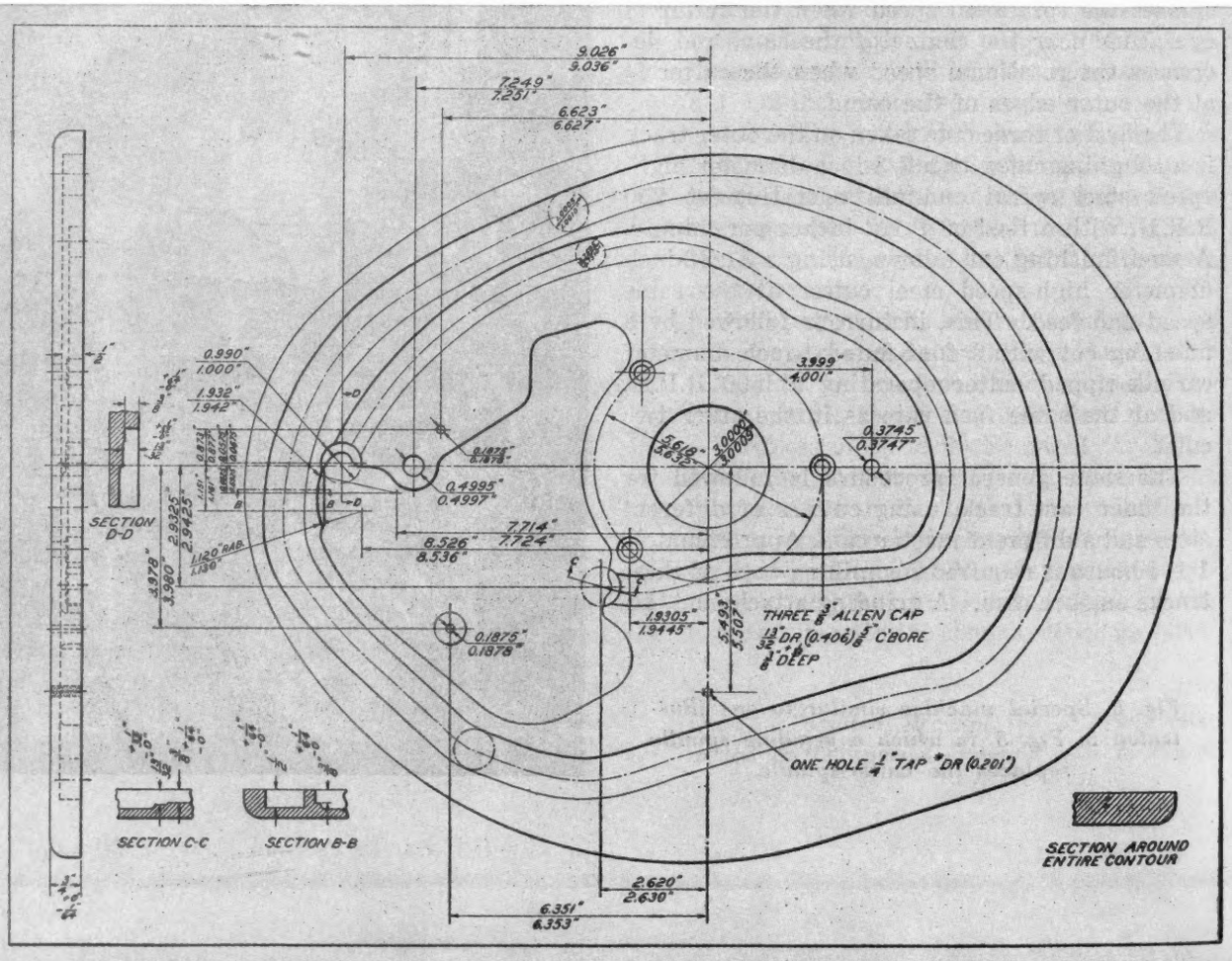


Fig. 10. (Below) Drawing of a cast-iron face cam used to provide a twisting motion for wrapping the outer leaf of tobacco around cigars

Fig. 11. (Right) Cam timing is especially important when more than one cam is driven from the same shaft as shown



veloped by the company, is also used when hardened and ground face cams are required.

In cases where more than one cam operates from the same drive-shaft, the timing of these cams becomes especially important. Fig. 11 shows a condition of this kind. These cams are cut interchangeably by the use of positioning holes and keyways in the cam blanks. Producing cams in this manner eliminates the tedious work of timing at assembly, and provides for ease of replacement in the field.

By the use of the equipment described in the foregoing, face cams up to 34 inches in diameter with a 17-inch throw and drum cams up to 30 inches in diameter with a 12-inch throw can be accurately produced.

A. G. M. A. Holds Conference Under New Reorganization Plan

ONE of the outstanding developments during the 1950 semi-annual meeting of the American Gear Manufacturers Association, held at the Edgewater Beach Hotel, Chicago, Ill., October 23 to 25, inclusive, was the announcement of a reorganization plan under which meetings will be conducted by four divisions that operate under the Standards and Practices Committee. The latter committee operates under the direction of the president of the Association.

The four divisions are: Speed Reducer and Gearmotor; Gearing; Development; and Industry Problems. Each division has separate subcommittees; for example, under the Speed Reducer and Gearmotor Division are Gearmotors; Helical and Herringbone; Worm-Gearing; High-Speed; and Oil-Field. Under the Gearing Division are Aircraft; Automotive; Fine-Pitch; Mill Gearing; Spur, Helical, and Herringbone; Railroad Gearing; Worm-Gearing; and Bevel Gearing. Under the Development Division are Gear Rating Coordinating; Technical Editing; Materials; Lubrication; Gear-Cutting Tools; Nomenclature; Splines; Tolerance Standards Coordinating; and Inspection. Under the Industry Problems Division are Labor and Public Relations; Government Regulations; Statistics; Accounting Procedures; and Manufacturing.

Among the papers presented at the general meeting were: "Some Aspects of Selecting and Applying Gears for Rolling Mill Equipment," by E. C. Denne, United Engineering & Foundry Co.; and "Some New Materials for Consideration as Gears," by C. M. Schwitter, International Nickel Co. (An abstract of this article appears on page 163.) An informal talk on the subject of gear lubrication was given by Professor Earle Buckingham, of the Massachusetts Institute of Technology. Professor Buckingham, as mentioned in November MACHINERY, was presented with the Edward P. Connell Award for his services to the gearing industry. The presentation address was given by Walter P. Schmitter, chief engineer of the Falk Corporation.

At the annual luncheon, Professor R. D. Meade, director of the Korea Technical Institute, Seoul, Korea, gave an interesting address concerning the circumstances that led up to the present conflict.

* * *

Henry Ford Memorial Award Offered by SAE Detroit Section

The Detroit Section of the Society of Automotive Engineers has announced a new award for the encouragement of the younger engineers. It is called the Henry Ford Memorial Award in honor of the late automobile manufacturer who did so much to encourage the young engineer. Any member of the Society under thirty-three years of age is eligible to compete.

The Award will be presented to the author of an original paper which has been presented or is suitable for presentation before an SAE meeting. The content of the papers must be limited to subjects related to automotive ground vehicles, and must describe engineering work or investigation with which the author has been directly associated. The award consists of a certificate of merit and a cash prize of $200.

Complete information is given in a pamphlet obtainable from the Detroit Section of the Society of Automotive Engineers, 100 Farnsworth, Detroit 2, Mich., or from any local SAE Section.

Production-Building

The Application of Continuous Production-Line Methods in Manufacturing Elevators is Unusual Because There are Seldom Two Elevator Installations Exactly Alike. This Article Describes the Production Methods and New Facilities Employed at the Otis Elevator Co., Harrison, N. J., in Manufacturing Hollow Metal Doors and Cabs for Elevators

SELDOM are two elevator installations exactly alike. Because of different requirements, and the necessity for variations in design, each elevator (and all its components) must usually be treated as an individual job, making ordinary mass production techniques difficult to employ. However, production methods have been successfully applied at the Harrison, N. J., plant of the Otis Elevator Co.

Here continuous production-line methods are used in the construction of hollow metal doors, headers, door frames, cabs, and other components of elevators such as are used in office buildings, hotels, factories, etc. The machines and other equipment used in this plant to cut, punch, shape, weld, clean, and paint these parts are arranged to facilitate the speedy transfer of the work from one operation to the next.

At the beginning of the production line, stainless-steel, bronze, aluminum, and hot- and cold-rolled steel sheets are stacked opposite a battery of seven Niagara shears. Cold-rolled steel sheets are used to the greatest extent in making elevator parts, 16-gage (0.0598 inch) stock being employed for hollow metal doors, and 14-gage (0.0747 inch) sheets for door frames and cab panels.

Hot-rolled steel is employed principally for such components as facia plates, strut angles, and headers, which are used inside an elevator hatch for carrying the hanger and track. These plates are sheared to suit individual designs, Fig. 1, the contract specifications being given on data sheets, from which cutting lists are made for each operator. After shearing the stock to the various sizes required, keyholes, slots, notches, and mounting holes are laid out from templets on tables located in an aisle adjacent to the shears.

Following the lay-out work, the sheets are taken to a battery of punch presses ranging in capacity from 45 to 75 tons. Here elongated holes and notches are punched according to the lay-out. When a number of sheets are to have identical holes, located in the same places, special set-up gages, such as the one shown in Fig. 2, are employed.

This gage consists principally of a table for supporting the stock and a track on which roller stops slide. The stops are located the same distance apart as the notches to be punched. The marked sheet is located for notching by placing one end under the punch, with the opposite end against the first roller. After each notch is made, the work is moved forward under the punch to approximately the correct position, the opposite end being brought into contact with the proper stop to obtain the exact position. The roller stops

Line Methods Employed in Elevators

By W. G. NUTZEL
Superintendent of Maintenance
Otis Elevator Co., Harrison Works

that are not engaged roll up on the top surface of the work.

Drill presses, tapping machines, and portable electric tools are also used for producing holes in the sheared stock.

Bending and shaping of the sheets following the shearing and punching operations are accomplished in a battery of three 400-ton press brakes located in the same line with the punch presses. Chrome-vanadium steel punches and dies, heat-treated to provide maximum toughness, are used in these presses for producing complex bends in such parts as door entrances, consisting of side and head frames, door sections, strips, and angles.

To eliminate tool marks in the shaped parts, a toolmaker, working in the immediate vicinity of the presses, polishes the dies and punches to a high degree of surface finish. Dies made to suit a wide range of shapes are stacked in racks adjacent to each press, Fig. 3, thereby facilitating set-ups for the many different forms that are required.

It is interesting to note that bends in the work are held to within tolerances of 0.005 to 0.010 inch by using adjustable set-up gages. Each press has four of these gages, located behind the ram in such a way that they can be moved individually in a longitudinal direction along the length of the die. Adjustments in the transverse direction are accomplished by means of threaded extensions on each gage, which can be locked in place when properly located.

Some of the door-entrance side and head frames are made with four small convex radii and a right-angle bend. The radii are produced by passing the work through a form die twice, after which a V-die and a gooseneck punch are set up for making the right-angle bend. One of these door-frame sections can be seen in Fig. 3, where an operator is shown selecting the form die to be used for this work.

Fig. 1. A battery of seven shears located near the sheet-metal stock pile is used to cut the sheets to individual elevator specifications

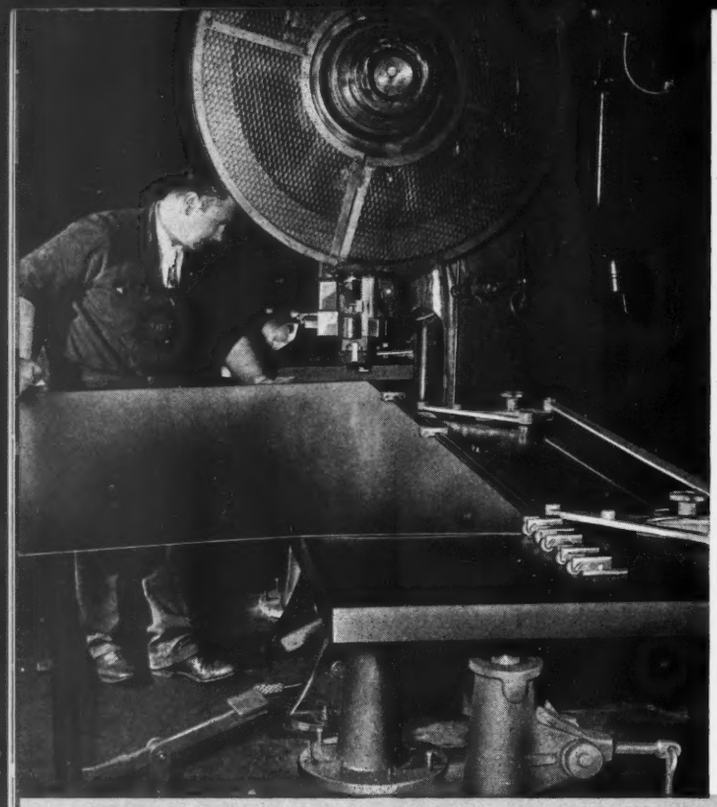
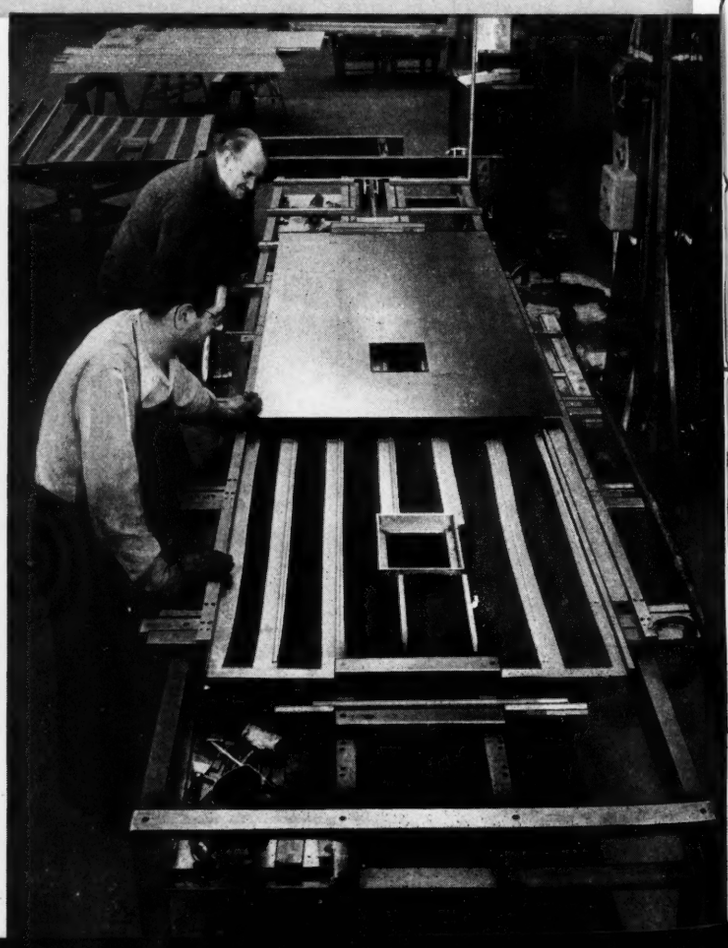


Fig. 2. Special gages are used with punch presses to locate the sheets for stamping notches, slots, key-holes, etc., required in hollow metal door sections

Fig. 3. Press brake dies, stored in racks behind each press to speed changes in set-up, are also conveniently located for polishing by a toolmaker

Fig. 4. Door frames and headers for elevator entrances are produced in a 400-ton press brake. A V-die and a gooseneck punch are used for making a right-angle bend

Fig. 5. Two halves of a hollow metal door are fastened by engaging the channels in one section with the clips in the other and drawing the two parts together



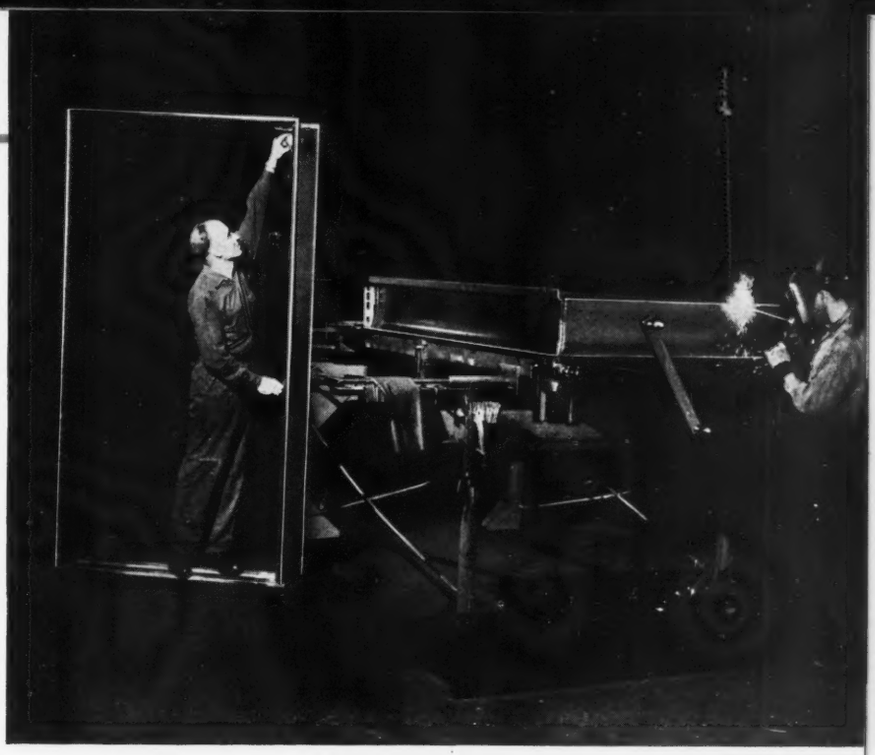


Fig. 6. Special fixtures, designed to suit assemblies of various types, are used in arc-welding door jamb sections

Another interesting shape formed in these presses is the convex radius section produced in another type of door-entrance side and head frame by using full-radius dies and punches, as well as forming dies. Fig. 4 shows a right-angle bend being produced in this work at the end of the radius. A V-die and gooseneck punch are employed in this set-up. The same equipment is used for making channels, which are later sheared to lengths suitable for individual elevators. Other shapes to which the door and frame components are formed include U-bends, flanges, hinge sections, and hems.

After the shaping operations, the door frames are taken to a saw for mitering the corners. Following this, clips for fastening them to door sills are spot-welded in place, as are also push-button reinforcements and other small units. Several bench operations, such as disk grinding the spot welds and fittings, are then performed.

In a bay adjacent to the press brakes is a group of arc-welding units by means of which the door-frame sections are welded together. Each unit includes a specially designed frame-welding fixture, Fig. 6, on which can be located large door-frame sections of all types. Using metal-arc and oxy-acetylene welding equipment, the welders join the edges of the clamped assemblies, by first tack-welding the edges together and then applying a small bead. The joints are ground smooth with portable pneumatic tools just across the aisle.

Several welding operations are performed on the door sections, beginning with the spot-weld-

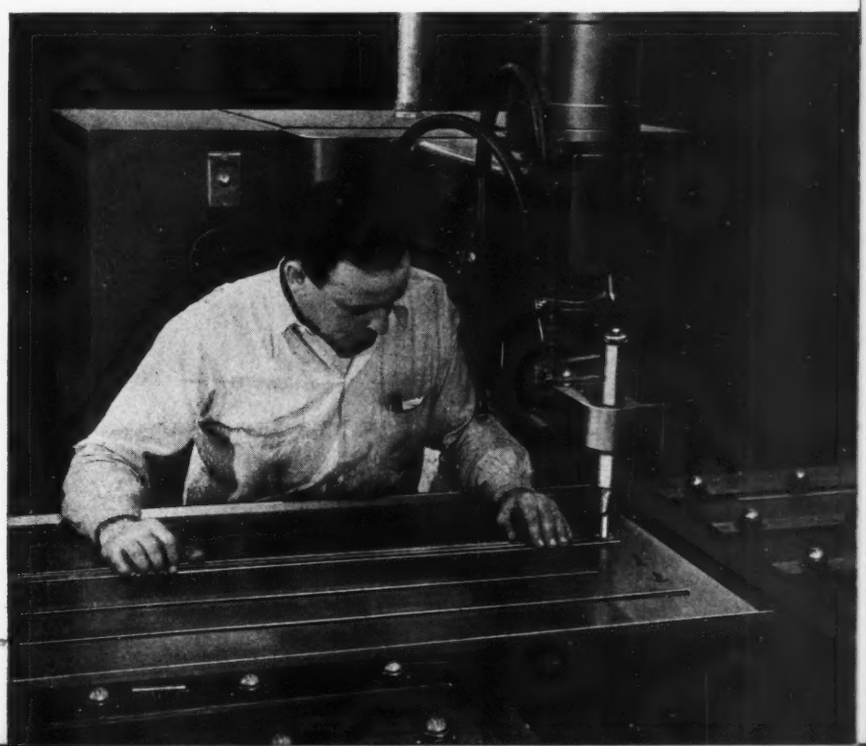


Fig. 7. Small sub-assemblies, such as clips for holding stiffeners in hollow metal doors, are spot-welded to door sections before assembly

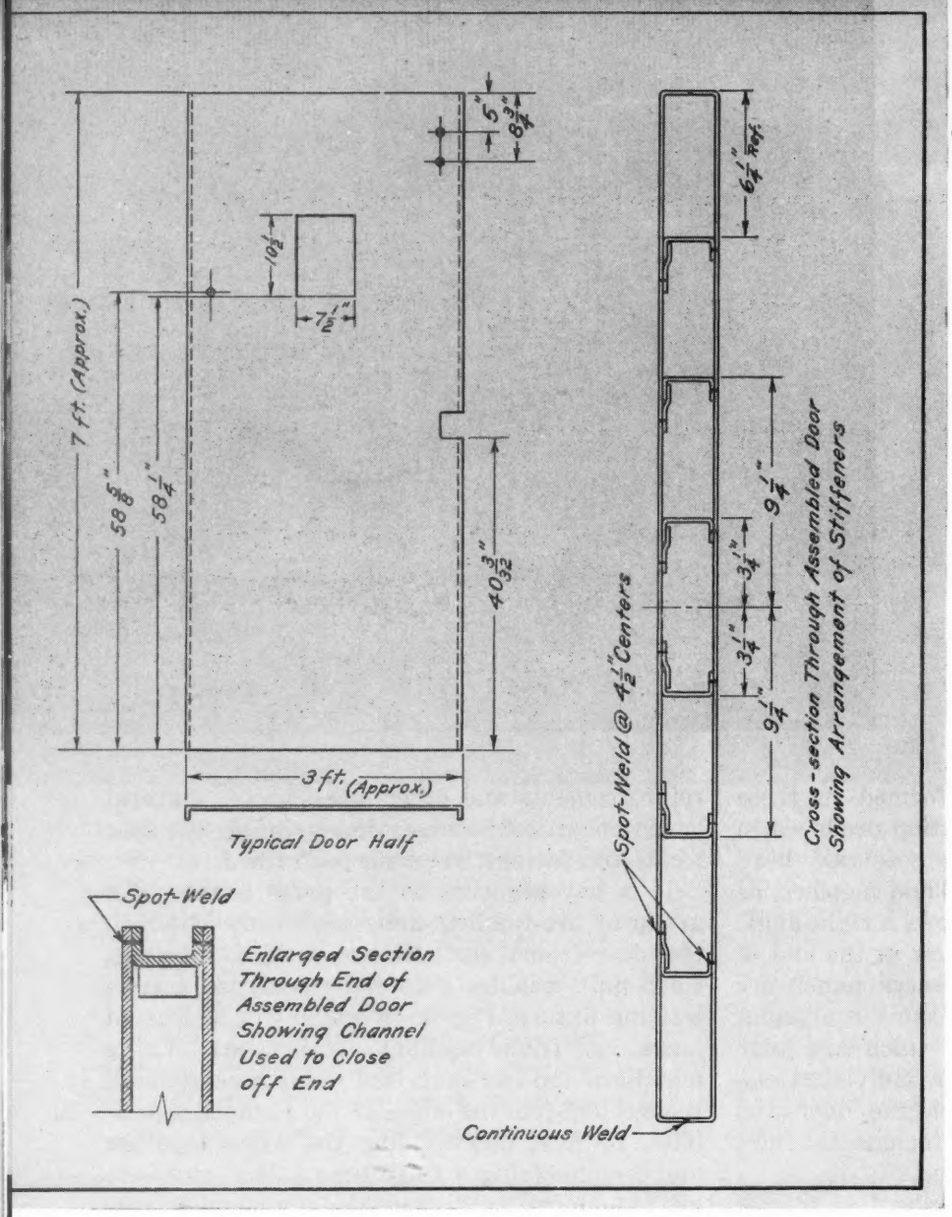


Fig. 8. Cross-sectional diagram of a hollow metal door, showing the engagement of stiffening channels in one section with clips in the other. Adjacent edges along the side are welded together

ing of small sub-assemblies to the formed halves. For example, one half of each door has clips spot-welded along its length at the center of one of the flat surfaces, Fig. 7, while channels are spot-welded to the mating half in corresponding locations. The channels, held in place by the clips, act as stiffeners when the two halves are joined to form a hollow metal door. The location of these clips and channels, as well as of strips and other small sub-assemblies on each door half, is determined by layouts made on the surfaces in accordance with the individual specifications for each elevator design.

Door halves are joined in the special fixture illustrated in Fig. 5. Here a section having clips is clamped in place on stationary supports, with the clips facing upward, and the half of the door having channels is located over it, with the channels facing downward in alignment with the clips. This half is then pulled along the

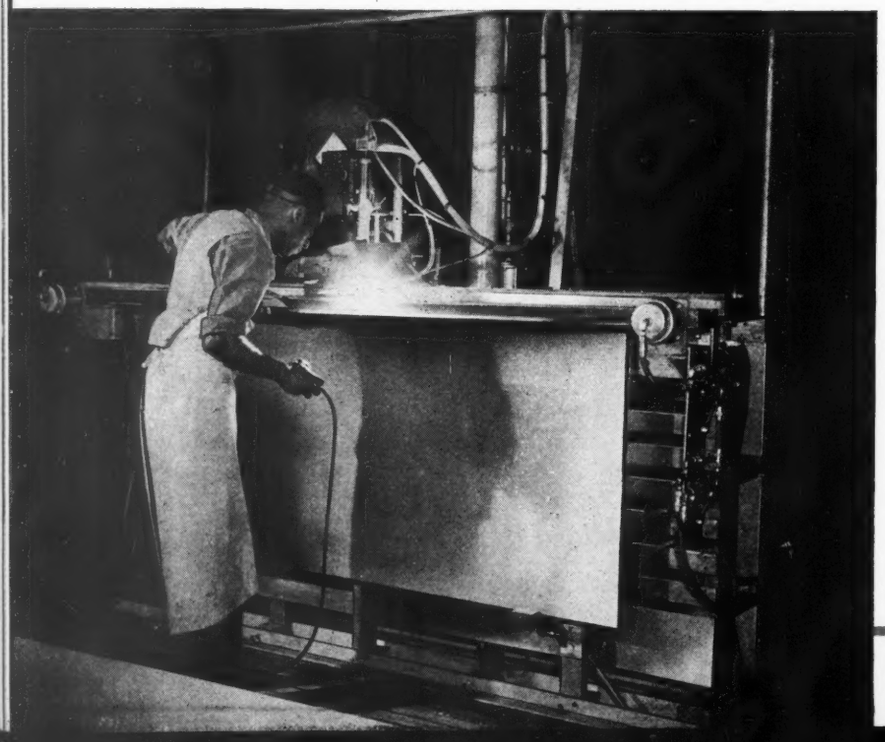


Fig. 9. The "Aircomatic" inert-gas shielded metal arc welding process is used for welding adjacent edges of both sides of hollow metal doors, which are clamped in an indexing positioner

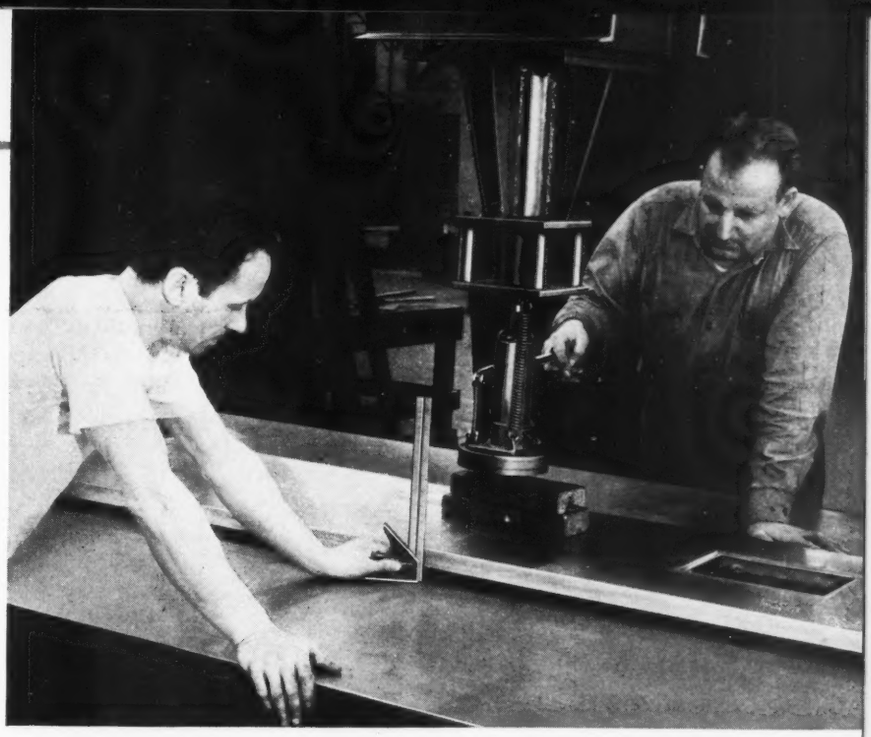


Fig. 10. High spots in hollow metal doors are flattened by the use of a straightening table and a hydraulic jack to within 1/32 inch across corners

table for a distance equal to the length of the door, so that the channels are snugly engaged with the clips, as shown in the cross-sectional diagram of a hollow metal door, Fig. 8.

Following this operation, the door halves are welded together at the sides, along the adjacent edges, by means of an automatic inert-gas shielded metal arc process. This welding method, known as the "Aircomatic" process, utilizes argon as a shielding gas while a filler metal wire, 1/32 inch in diameter, is fed automatically and continuously to the arc from a reel just above the welding head, as shown in Fig. 9. The arc speed is 30 inches per minute, and 120-ampere, straight polarity current is employed for this set-up.

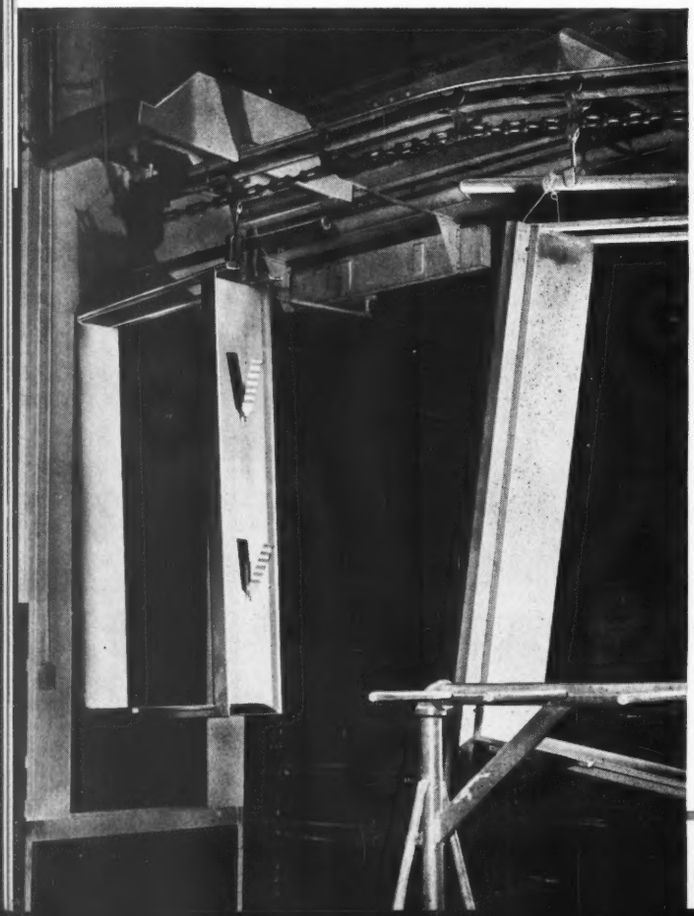
A manual control knob on the head is operated by the welder to adjust the position of the arc relative to the work. This permits moving the arc up and down as well as sidewise. A switch in the operator's right hand is used to shut off the arc at the end of the weld or at any other time desired. An air-operated work-positioner with two air clamps holds the work and raises it into position under the welding head.

Although a very smooth and uniform bead is applied by this process, the joints are ground perfectly flat before the doors are passed on to the next operation. This operation, which is the last, as far as construction and assembly are concerned, consists of spot-welding channels at the tops and bottoms of the shells to close off the ends of the doors.

After this operation, the doors are made absolutely free of twists by using a straightening table with a hydraulic jack on it, Fig. 10. Wherever a door may have a high spot, pressure is

Fig. 11. Special tables, having freely rotating balls mounted on their working surfaces, permit easy positioning of work in spot-welding machines of the type illustrated

Fig. 12. Ventilation slots and other perforations are produced in elevator cab panels by feeding the work through a two-cavity die in this deep-throated press



applied to flatten it. Flatness from corner to corner is held to within 1/32 inch.

Bench work, consisting of drilling holes for mounting door pulls, guides, molding, etc., follows this operation, after which the doors are rigidly inspected before belt sanding preparatory to painting.

Elevator cabs, such as those shown in the heading illustration, are processed through the plant in much the same manner as the hollow doors. Press brakes, for example, are used extensively for shaping and bending parts of the cabs. Cab walls are made of 14-gage cold-rolled steel and are laid out for punching notches, slots, keyholes, etc.

A 25-ton, deep-throated, Niagara press, Fig. 12, is employed for punching ventilation slots in cab panels, the work being fed through a two-cavity die. In other presses, relatively small dies are used to punch out window holes, control-box apertures, and other large openings in cab sections. This is accomplished by using specially designed work-positioning tables, which permit longitudinal and transverse movement of the work, so that any size hole can be produced by feeding work to a die in two directions.

Other operations on cab sections include the spot-welding of sub-assemblies to panels, as illustrated in Fig. 11. To facilitate the handling of work at these machines, special tables having freely rotating balls mounted on their surfaces are used. The balls permit sliding the steel sheets to any desired position under the welding head. As shown in the heading illustration, elevator cabs are assembled, with the components clamped together to permit precise fitting of all the parts, after which the components are bolted and screwed together and then disassembled, painted, and shipped.

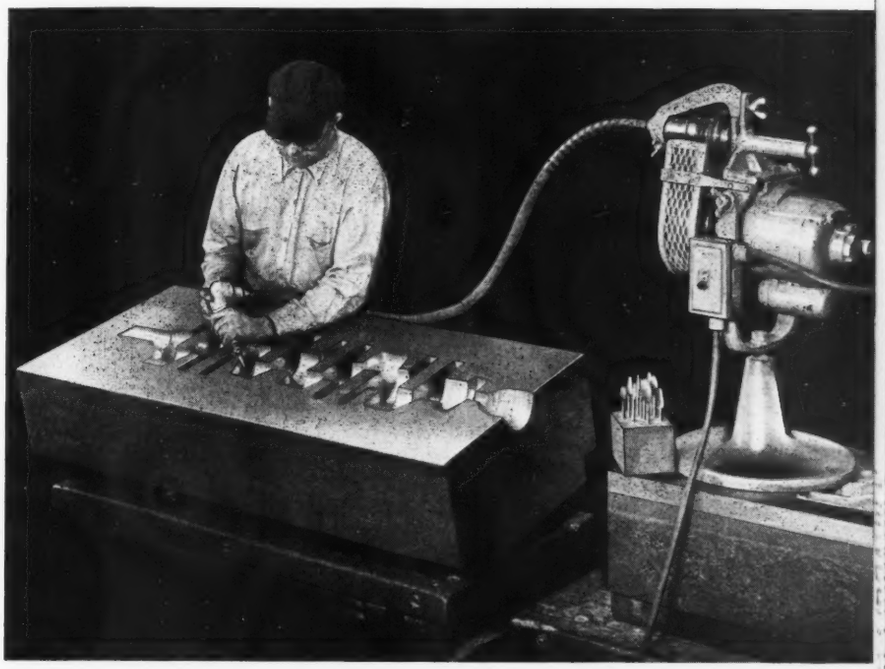
An overhead monorail conveyor, Fig. 13, is employed to carry the elevator parts through the final stages of completion. These include a chemical cleaning process and the application of a rust-resistant base on parts that are to be painted. Paint is applied by spraying and is baked dry as the parts are carried through ovens heated to about 350 degrees F.

Fig. 13. Overhead monorail conveyors, moving at approximately 3 1/2 feet per minute, carry elevator entrances through chemical cleaning and rust-resistant processes, as well as through painting booths and drying ovens

Carbide Burs Simplify Difficult Machining Operations

Hardened Dies and Molds are Quickly Altered without Annealing, Inaccessible Corners and Recesses are Easily Machined, and Many Other Machining Problems are Solved by Making Use of Carbide Burs. This Article Describes Various Types of Carbide Burs and Their Applications

By GEORGE H. DeGROAT



CEMENTED-CARBIDE burs have a wide range of applications in the metal-working field because of their long life, good cutting action, versatility, and the many different sizes and shapes available. Used with flexible-shaft machines or other portable tools, these burs provide a convenient way of quickly removing metal from the corners of large parts or from cavities that are hard to reach. They are employed extensively for blending weld beads, removing scale, chamfering, forming fillets, removing tool marks, slotting, bevelling, etc. It is not uncommon to use a carbide bur for cutting steel hardened to 65 Rockwell C at one speed and to employ the same bur at another speed for machining aluminum.

Of course, the design of these tools is of the greatest importance as far as performance and application are concerned. Machine-ground burs, for example, have accurately spaced teeth of even depth, with uniform helix and rake angles, and the flutes are concentric with the shank. These characteristics produce a smooth cutting action and eliminate any tendency of the tool to jump or bounce, which would result in chipped teeth. Another important factor in the construction of these tools is the way in which the steel shank and the carbide head are joined, in order to produce the high degree of concentricity and strength required.

"Kellerflex" carbide burs, made by the Pratt & Whitney Division of the Niles-Bement-Pond Co., West Hartford, Conn., are ground from solid blanks in special machines that utilize a master form to control the movement of the diamond wheel head. This provides true running concentricity between the shank and the body because all flute grinding is done after the carbide blank has been assembled to the shank. A coolant is used in this grinding operation to prevent surface cracks caused by overheating and also to permit the use of fine wheels that produce smoothly finished flutes.

Burs "master-ground" in this manner have flutes that center uniformly at the ends, resulting in the same number of equally spaced teeth at any cross-section throughout their shape. Chip clearance and good end cutting action are assured by providing a number of extra deep flutes, equally spaced, around the periphery of the bur. Smooth flutes and sufficient chip clearance are especially important in carbide burs

Fig. 1. A specially developed bur, known as the "Di-Bur," that is machine-ground with a diamond pattern to break up long slivers into granular chips

used for cutting non-ferrous materials. The true running characteristics of these burs insure equal cutting action of each tooth, tending to make the tool last longer and hold its shape through many resharpenings.

A strong joint between the bur head and the steel shank is provided by using nickel, 0.010 to 0.015 inch thick, between the layers of brazing material at the joint. This absorbs vibration and reduces shock. Burs 1/4 inch in diameter and smaller are made of solid carbide, so that there is no joint problem in the smaller sizes.

A typical application of a "Kellerflex" bur is shown in Fig. 3, where a weld bead on stainless steel is being blended. In this case, a standard 1/2-inch diameter bur having thirty-six flutes is used at a speed of 33,600 R.P.M. The bur has a "tree" shape, with a radius at the nose end, and is 1 inch long. Heavy cuts can be made with the large end of the tool and finishing cuts with the nose. As shown at *P* in Fig. 2, burs of this shape are also used extensively for profiling cuts.

Although standard grades of tungsten carbide are used for general applications (Carboloy Grades 883 and 44-A), a special grade is employed for cutting stainless steel. This is Carboloy Grade 779, which consists of tungsten carbide combined with tantalum carbide.

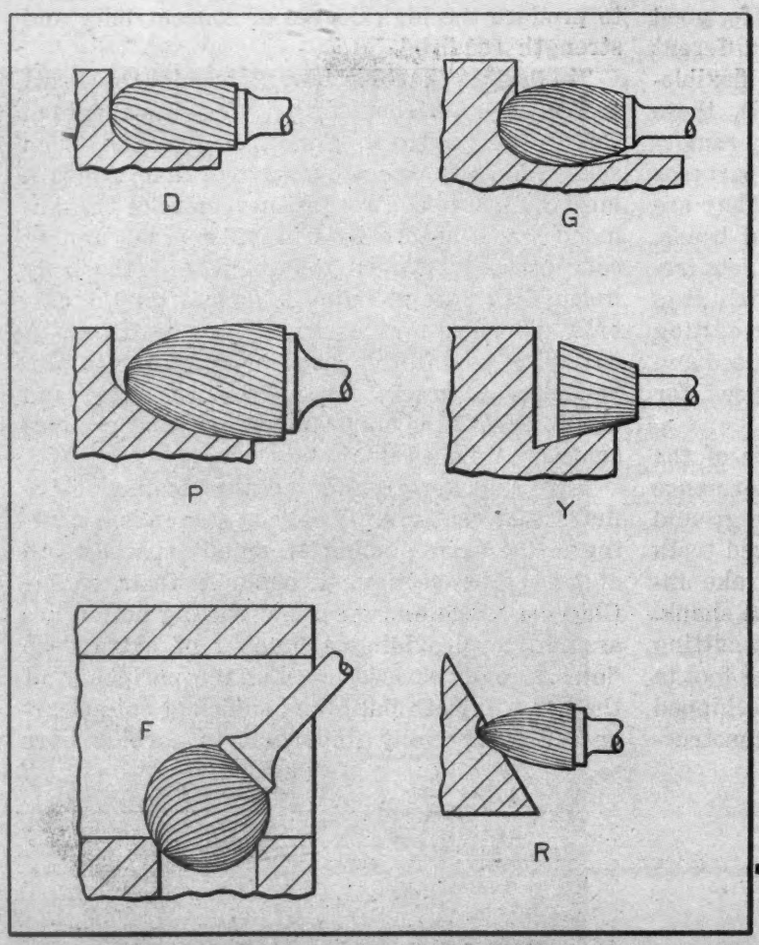


Fig. 2. Examples of some of the many different shapes of machine-ground carbide burs used in various applications. Identifying letters designate Pratt & Whitney shapes

Fig. 3. Weld beads in stainless steel are blended with a 1/2-inch diameter, thirty-six-flute carbide bur running at 33,600 R.P.M.

Fig. 4 shows a 1/2-inch diameter, thirty-six-flute carbide bur used with a "Kellerflex" flexible-shaft machine for cutting an angle on the face of a punch for a "clicker" die. This bur has a 14-degree included angle and is 1 1/8 inches long. A speed of 21,000 R.P.M. is employed for this operation, which is considerably facilitated by the flexibility of the set-up.

Fig. 5 illustrates the use of a carbide bur, operating at a speed of 21,000 R.P.M., for blending a form machined in a forging die and removing machining marks. The same operations are performed on other sections of this die with burs of different shapes, some of which may be seen on the die in the foreground. The 1/2-inch diameter, 1-inch long bur seen in use is of cylindrical shape with a ball nose, and has thirty-six flutes. Burs of this shape are especially useful for blending a fillet next to a flat surface, as shown at *D* in Fig. 2, and are also widely used for enlarging holes because the accurate ball nose can be seated in the hole.

The bur shown in the heading illustration has a 14-degree included angle and is being used to remove tool marks and to blend the form of a crankshaft forging die. This tool also has thirty-six flutes, and is operated at 15,600 R.P.M.

Ball- or spherical-shaped burs have many advantages. For example, grooves, fillets, or radii can be finished from any convenient position, and with a simple guide, these tools will cut grooves where milling is impossible. They are often employed for finishing inside rounded corners of tanks and containers or for deburring tubes, milled slots, and drilled holes.

A typical application is shown diagrammatically at *F* in Fig. 2. Since these burs are spherical, they can be used from any angle, resulting in fast stock removal when using the side, and providing a fine finish when cutting with the end of the ball, where the rotating diameter is smaller.

Many other shapes are used for various purposes. Among these is the inverted cone shown at *Y* in Fig. 2, which is employed to remove imperfections on castings and parts with undercuts. The tree shape with pointed nose seen at *R* is used on sharp inside corners of forging and stamping dies and on angular welds that must be

Fig. 4. A carbide bur tapered to a 14-degree included angle is used to cut an angle on the face of the punch shown

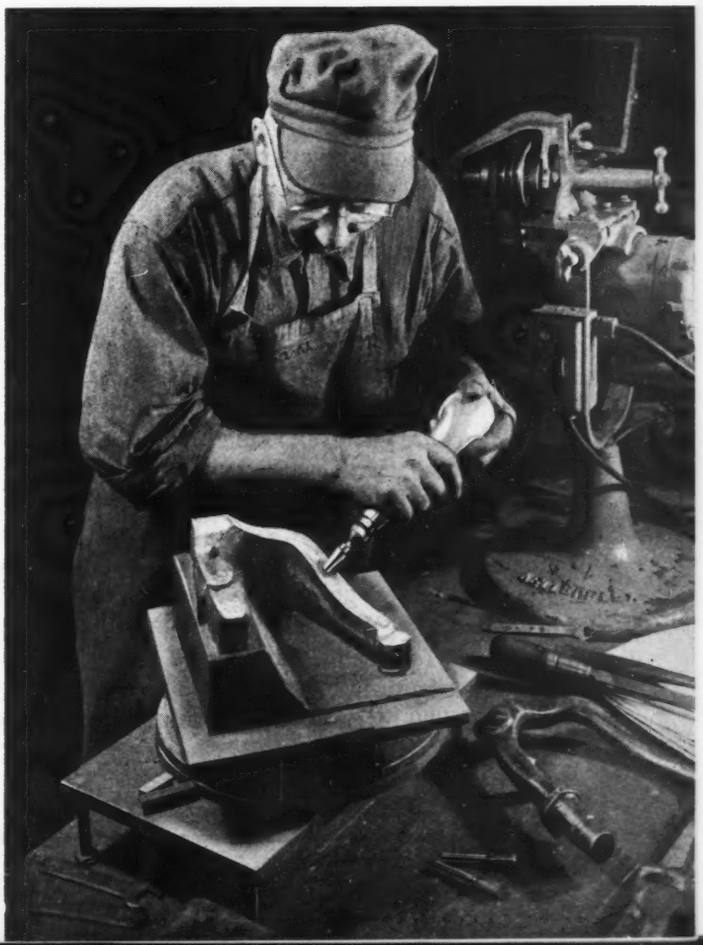


Fig. 5. This carbide bur, running at 21,000 R.P.M., is employed to remove tool marks and to blend forms in a forging die

cleaned of excess metal. Blow-holes, pit marks, and imperfections on sand castings are quickly removed and blended with burs of this shape. Another widely used tool is the oval-shaped bur shown at *G*, which is employed for blending and finishing partially enclosed areas of irregular contour. This type of bur is best applied by using the nose on long curves, and the main body periphery on the more abrupt, sharper contours. As may be seen in the illustration, the shank end of the body is smaller than the largest diameter, permitting an operator to work either toward or away from himself without digging into the work.

Speed is an important factor in the efficient use of carbide burs. A constant, steady, high speed reduces shock, which is the principal weakness of carbide cutters. This also aids in clearing chips away, which otherwise might build up and suddenly break away, causing tooth fractures. Theoretically, the speed of a burring tool is calculated on the basis of the number of flutes that pass a given point in a specified length of time. Pratt & Whitney bur experts have developed the following simple rule for determining the safe minimum speed of any carbide bur: Divide 500,000 by the number of flutes. Thus, the lowest operating speed for a thirty-six-flute bur would be $500{,}000 \div 36 = 13{,}900$ R.P.M.

The area of contact of the bur has a considerable influence on the type of finish produced and the amount of stock removed. This fact can be used to advantage when a limited number of speeds are available, since the same finish can be obtained on a particular material by using a coarse bur that is twice the diameter of a fine one at the same speed that would be employed for the finer tool.

Although fine, medium, and coarse burs are generally available to reduce the need for speed changes, it is possible to obtain a better finish with a medium or coarse tool by increasing the speed, and, conversely, a greater stock removal rate, with coarser finish, will result from running a fine or medium bur at a slower speed. In general, speeds should be decreased with dense materials in order to obtain greater cutting action, and increased when cutting soft materials, since the tool must run faster to prevent chatter.

Carbide burs can be resharpened many times over. It is advisable to return burs to the manufacturer for resharpening as soon as they become dull, because such tools have a rubbing action rather than a free cutting action.

A recent development in carbide burs is the Kellerflex "Di-Bur" shown in Fig. 1. This tool was designed to overcome two difficulties sometimes encountered with full-fluted carbide burs. One of these is the long, sharp, needle-like slivers produced by the bur in cutting die steel. These slivers can penetrate an operator's hand, causing infection. The other difficulty is that the speeds required for carbide burs are often higher than those used with standard portable machines.

To break up the long slivers into granular chips, a diamond pattern is ground into the flutes of Kellerflex "Di-Burs" after they are machine-ground in the same way as standard full-fluted burs. Extra deep flutes are also cut in these tools at specified intervals for chip clearance.

Originally designed for cutting die steel, it has been found that "Di-Burs" are more easily controlled than full-fluted burs, with the result that they are widely used in shops outside the die industry.

It has also been found that the "Di-Burs" can be run at two-thirds the speeds generally recommended for standard full fluted burs. As a result, equipment normally available can be used with these tools.

Closer Management-Labor Unity Can be Built on Election Results

AMERICAN workingmen still reserve their right to cast their ballots as they choose. Their votes cannot be delivered en masse to the selected candidates of professional labor leaders. This is one of the gratifying conclusions to be drawn from last month's elections. It may be a sign that it has become unprofitable to pit class against class; that the majority of the people will vote as their consciences dictate for the welfare of the country.

Organized labor conducted a vigorous campaign to defeat all members of Congress who had voted in favor of the Taft-Hartley Act and the Wood Bill. Of fifteen senators singled out for defeat, only one was beaten. Out of 196 members of Congress running for re-election who had voted for the Wood Bill, only four were defeated, whereas there were twenty-eight casualties among the 190 who voted against that bill.

The huge pluralities given Senator Taft, Congressman Dirksen, and Governor Dewey would not have been possible except for the fact that members of labor unions by the thousands voted according to their personal choices. It is a singular point that Senator Taft carried every industrial area of Ohio. Obviously, rank and file union members could no longer believe the misrepresentations of their leaders concerning the Taft-Hartley Act when they knew by personal experience that the Act had not prevented wage increases or hindered improvements in working conditions.

Rather than gloat over an unanticipated change in political trends, businessmen should direct their efforts toward fostering greater unity between management and employes. If there are any inequities in the Taft-Hartley Act that are truly detrimental to the interests of the workingman, aid should be extended to Congressional leaders in developing suitable modifications. Such an effort would probably eliminate the possibility of labor leaders again using the Act as an issue in future elections.

Management and labor should also strive to develop a sensible solution of the price and wage problems that confront the nation. If prices and wages are permitted to continue uninterrupted spiraling, the Government will find it imperative to set up irksome controls. The fewer direct controls, the better off everybody will be.

In these critical days, when an aggressor nation seems bent on fomenting a conflict that may threaten our very existence, there is no time for petty squabbles between management and labor. Peace on the industrial front is essential to early fulfillment of the program that has been set up by our military leaders to prepare ourselves for possible national defense.

Charles O. Herb

EDITOR

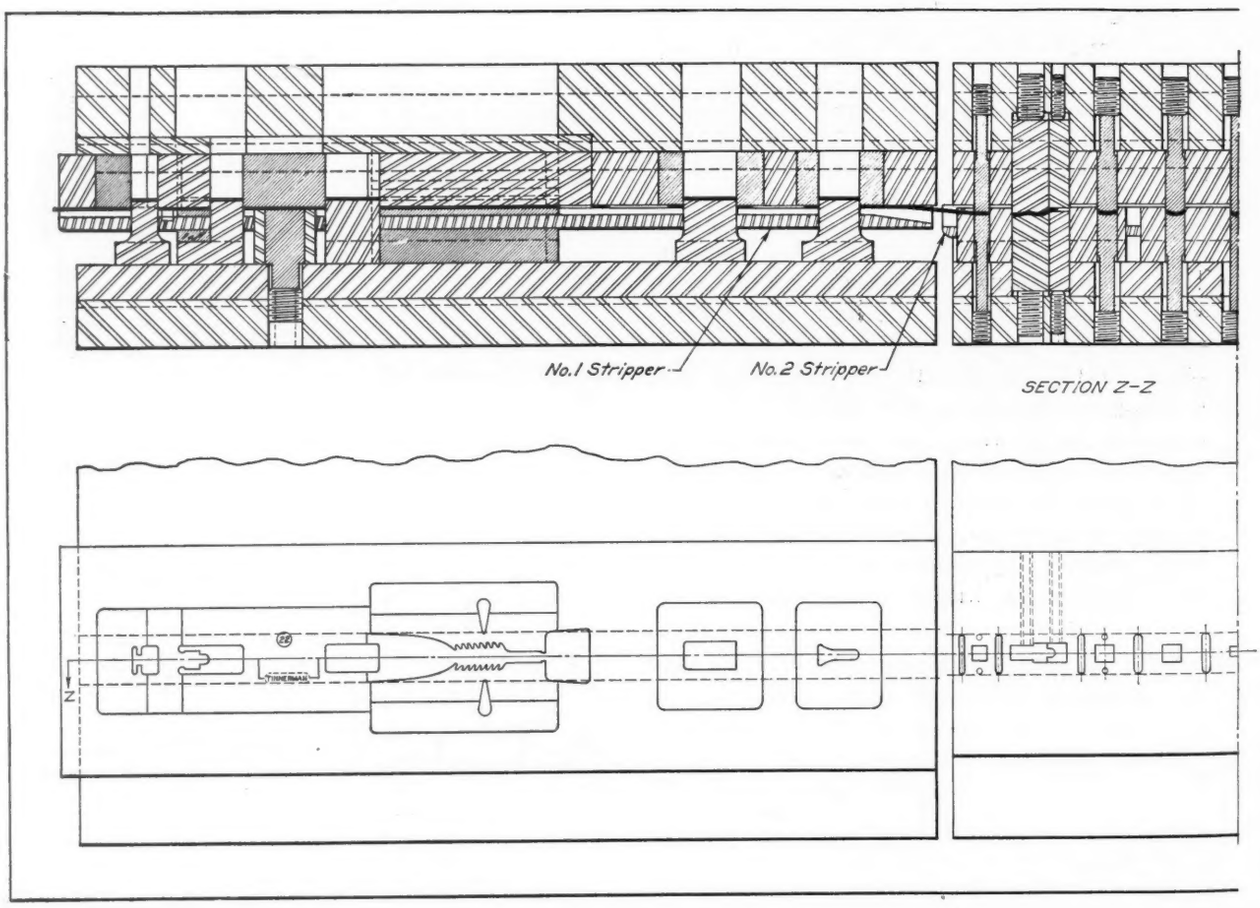
Complicated Part Produced

Fig. 1. Speed clamp used for hose attachments

THE speed clamp for hose attachments shown in Fig. 1 is required to be made in large quantities at the plant of Tinnerman Products, Inc. This complicated shaped part is turned out at a high rate of production on a Multi-Slide machine (built by U. S. Tool Company) by the use of the dies illustrated in Figs. 2 and 3. This type of clamp has the advantage of being rapidly and easily applied, since it is held initially by serrations when closed by hand, after which pliers are used to tighten it.

The clamp is produced from S A E 1060 coiled ribbon stock, 11/16 inch wide by 0.022 inch thick. In operation, the stock is fed through straightening rolls and into the first set of dies, shown at the left in Fig. 2, which consists of five punches that pierce holes of suitable shape for the openings required, a punch for stamping the name of the maker and the hose size, and a pair of notching punches that shear off stock at each side along the portion where teeth are later produced. Strippers are provided, and the slugs from the cut-out parts pass out of the back of the die.

Fig. 2. Details of dies employed on a Multi-Slide machine for piercing, blanking, and forming operations on



on a Multi-Slide Machine

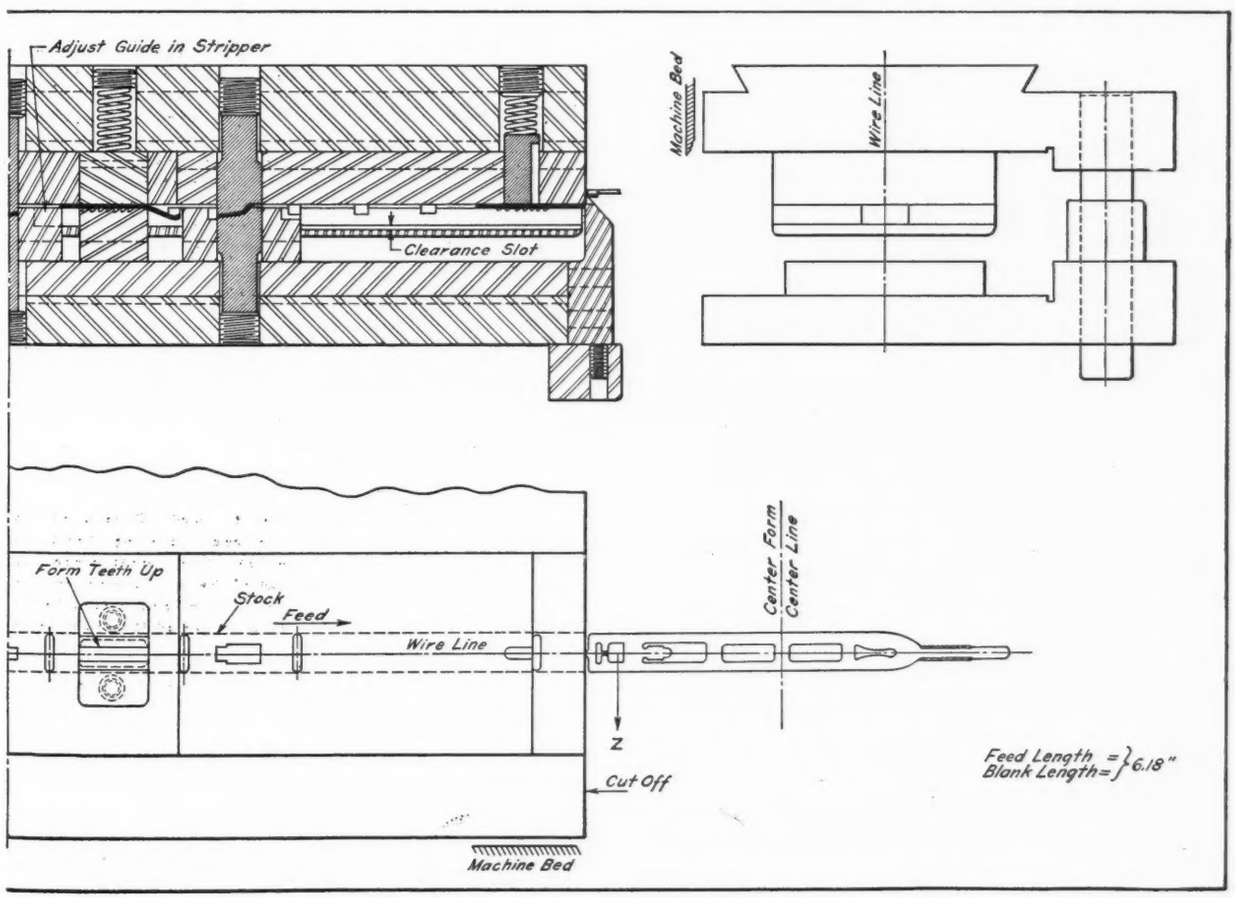
By JOHN SPOFFORD, Special Project Engineer
Tinnerman Products, Inc., Cleveland, Ohio

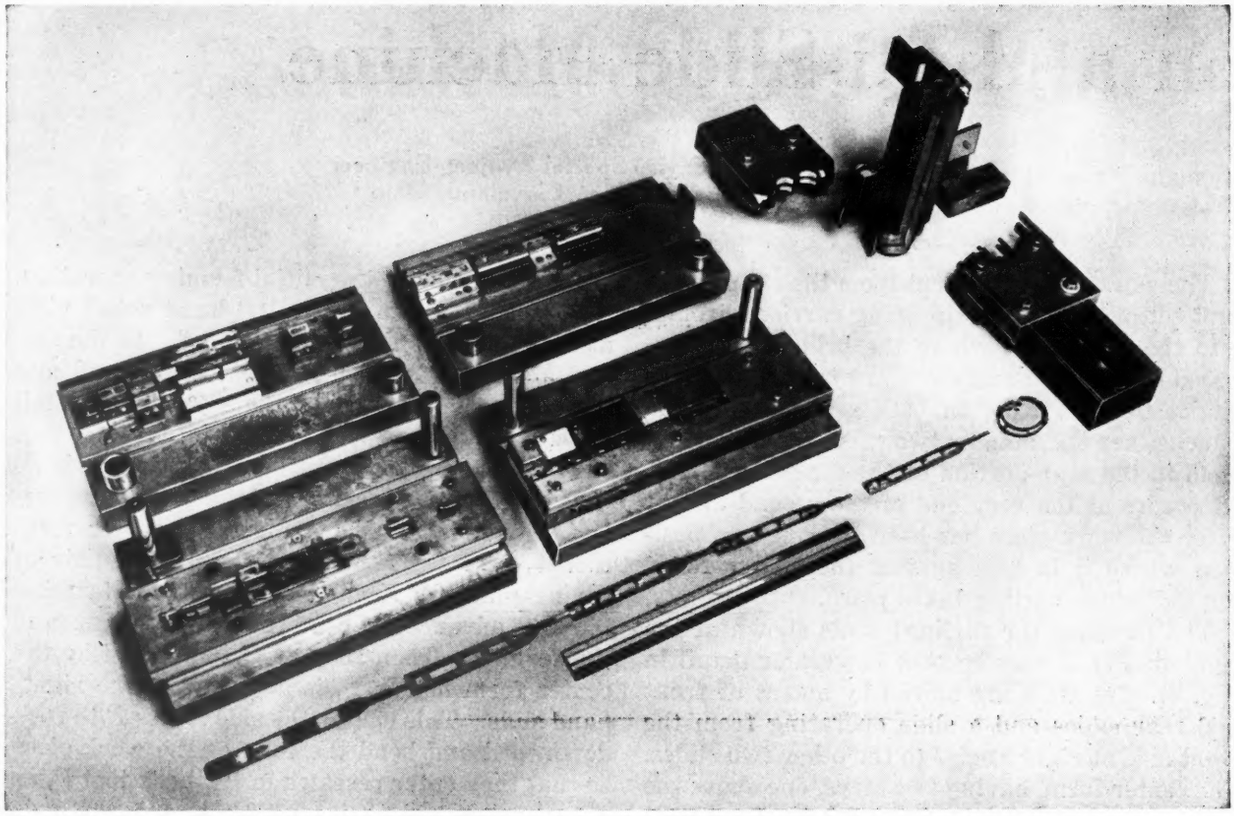
The work-piece is not cut from the strip in the first set of dies, the strip being carried through into the second set where the bridges are produced on the part and teeth are formed at right angles to the strip. In both sets of tools, the punches are operated by two rams, the dies being fixed in the rear portion of the die-holder. Cut-off occurs at the very end of the second die set after the work-piece has been fed out to a position where it is held against the center form, around which curling takes place.

The forming (or curling) tools shown at the right in Fig. 3 may be seen in greater detail in Fig. 4. The tools are moved by means of front and rear slides and a slide operating from the right side at right angles to the other two slides. The center form, having two steps, one above the other, remains fixed. Initial forming is accomplished at the upper level and final forming at the lower level. In the initial forming operation, the C-shape shown in the left-hand detail view at the bottom of Fig. 4 is produced. In the second and final forming, the work is closed and interlocked, as shown in the right-hand detail view.

The sequence of operations in forming is as follows: The blank cut off at the end of the second die set is pressed against the center form tool *A*, Fig. 4, at the upper level by a pair of spring plungers *K* as the upper front forming tool *B* is advanced to bend the work-piece around the form *A*. Then the bar *C*, supported by the center form holder *D*, is actuated by the right-hand slide. This causes the side levers *E* to rock downward and bend the ends of the work-piece so that they enter recesses in the back tool *F*, as it is advanced by the rear slide to curl the ends of the piece around form *A* at its upper level.

the hose clamp shown in Fig. 1. The dies are used progressively, but a piece is completed at each machine cycle





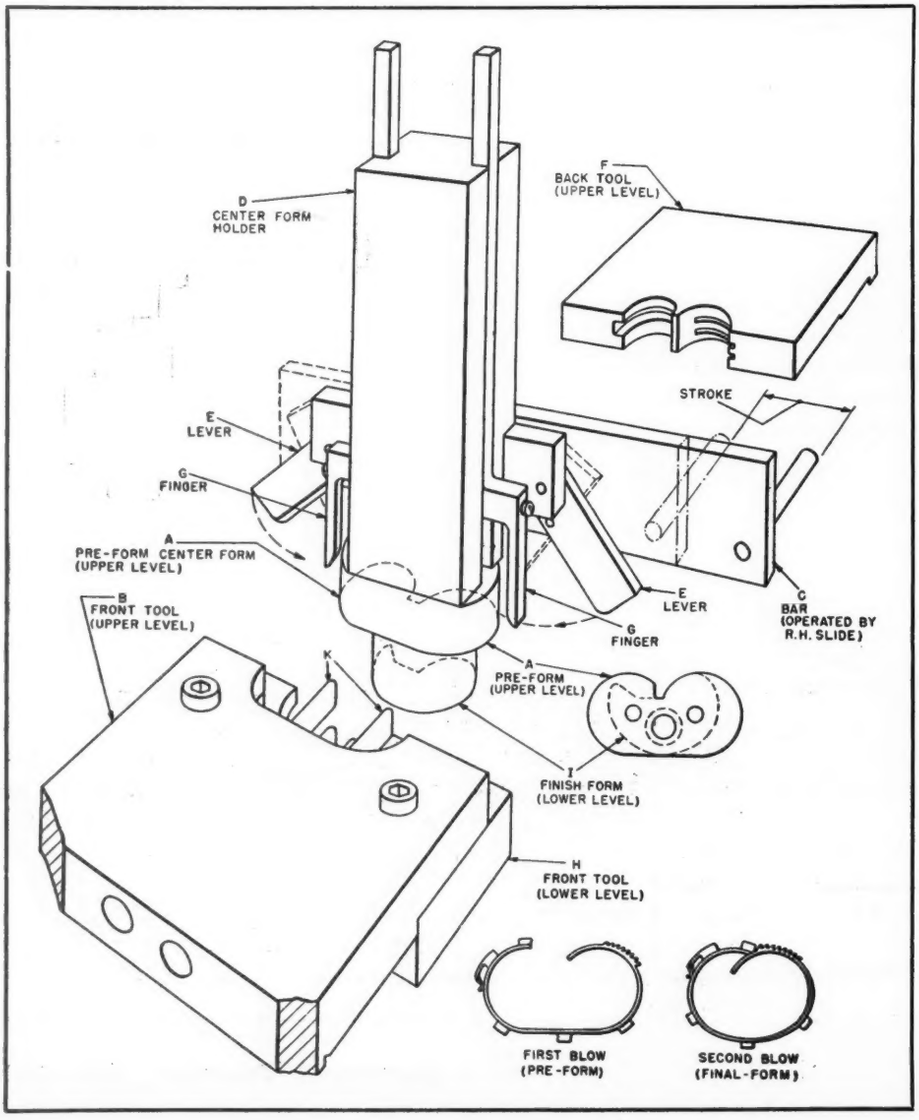


Fig. 3. (Above) Complete tooling equipment used in producing the hose clamp. The two-level forming tools used to produce the final shape are shown at the right. In the foreground is seen strip as it appears in successive stages and after the part has been cut off

Fig. 4. (Left) Details of the two-level forming tools in which the work-piece is curled to a C-shape at the upper level and closed to its final shape at the lower level

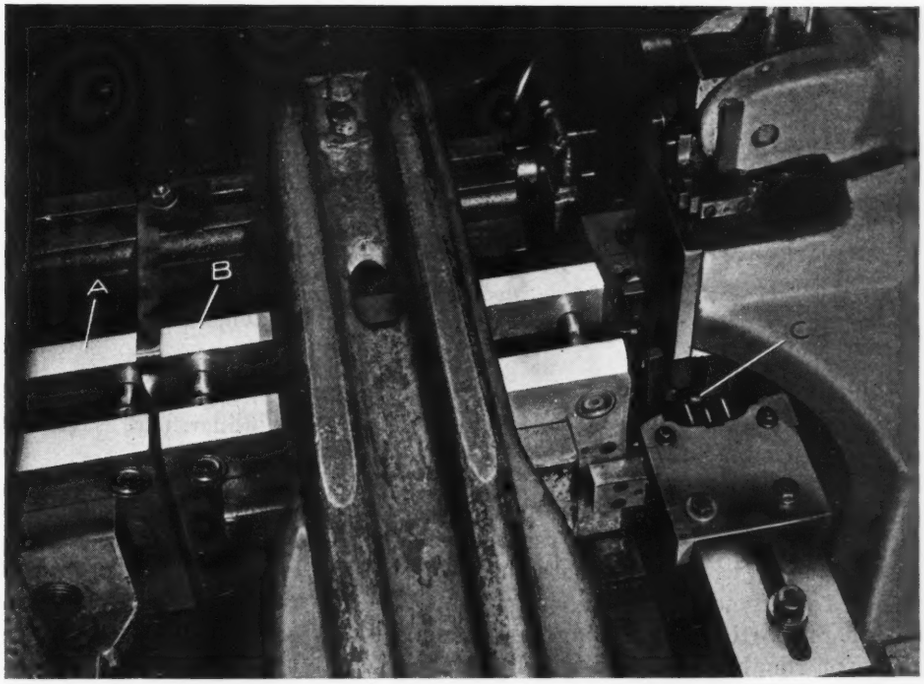


Fig. 5. Close-up view of die set-up in a Multi-Slide machine employed for blanking, piercing, and forming hose clamps

When the back tool is withdrawn, the front tool also withdraws, leaving the work-piece curled around the form, the piece then having the shape marked "pre-form" in the detail view. Fingers *G*, sliding down the center form holder *D* and actuated by a kicker arm (not shown), strip the work-piece off the upper step *A* to a level opposite the lower form *I*. Then the fingers are returned to their upper position, clear of form *A*, completing the first portion of the cycle.

At the second stroke, the front slide is again advanced and the lower tool *H* forms the work-piece around the lower portion *I* of the center form. As the front slide, and tool *H*, is withdrawn, springback, supplemented by air if needed, frees the finished work-piece from the form *I*, and the hose clamp drops from the machine. As a new piece is formed at each advance of the front slide, a finished clamp drops from the machine at the end of each cycle. Since the machine normally completes 3000 cycles an hour, unless stopped for adjustment, it will be seen that a high production rate is attained.

The close-up view, Fig. 5, shows the general arrangement of the dies and some of their actuating parts. The first die is shown at *A*, the second at *B*, and the forming tool at *C*. Although clamps of a similar type could be produced in a conventional punch press, provided with suitable dies, a Multi-Slide machine is better suited for the rapid and economical production of parts of this nature.

Preparation of Aluminum for Paint Finishes

A new immersion process for protecting aluminum has recently been developed by the Metal Finishing Division, Pyrene Mfg. Co., Newark, N. J. The Pylumin process, as it is called, can be used to provide a corrosion-resistant coating in cases where no paint finish is to be applied, and also to produce an adhesive base for paint finishes.

It is claimed that since this is an immersion process employing a single powder whose ingredients have been proportioned and pre-mixed, there is no chance for error, such as might occur if separate powders had to be proportioned and mixed in a certain order. The solution is easily maintained by the use of a simple test kit and the addition of the powder whenever necessary.

The costs of installation and operation are low, ordinary heated steel tanks being the only equipment required. Special cleansing prior to processing is not necessary. The process is adaptable to various products made of aluminum and aluminum alloys, and since there are no dimensional changes, allowances for such changes need not be made in order to maintain close tolerances on the finished part.

* * *

One out of every seven patents issued in the United States during 1949 was an automotive patent.

Design of Worm-Gear Hobs

Second in a Series of Articles Describing Methods of Designing Various Types of Worm-Gear Hobs, Based on British Practice

By F. G. WATTS
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THE first article in this series reviewed the conditions essential to the proper generation of worm-gear tooth profiles and the design requirements of fly hobs. In this article, design proportions of straight and tapered full hobs for rough- and finish-hobbing worm-gears are discussed.

A straight hob is the simplest type of full hob used for cutting worm-gears, and may be regarded as a worm with the thread fluted and relieved to provide cutting edges. Usually, the flutes or gashes are at right angles to the thread, since this method of gashing provides the strongest cutting profile, but this design is not invariably adopted. Such a hob is fed radially into the worm-gear blank until it is at full depth, after which it is usually fed tangentially for a short distance. This tangential feed is very desirable, if it can be arranged, since it materially improves the profile finish on the gear teeth. It should be noted, however, that the straight type of hob is used when there is insufficient space to allow for any appreciable amount of tangential feed, as for example, for a high-ratio worm-gear, where the worm is small and the gear is large. In such circumstances, there is only a small amount of clearance between the outer diameter of the worm-gear and the bearing housings of the hob, as indicated in Fig. 6. To provide the clearance essential for a full tangential feed would necessitate spacing the bearings a considerable distance apart. This would weaken the hob, and render it liable to excessive deflection and even breakage.

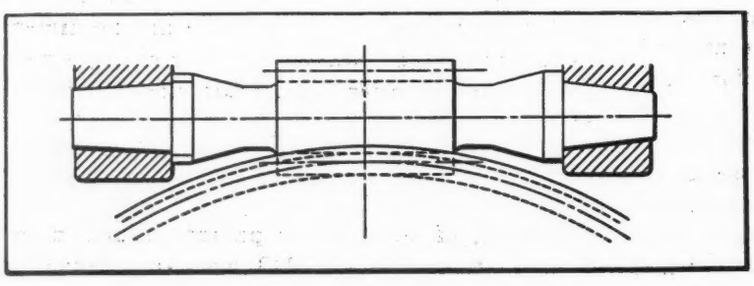


Fig. 6. Straight hob in mesh with worm-gear

The general proportions of the thread may be deduced from an examination of Fig. 7, which shows a development of a section of the hob pitch cylinder (*AB* being equal to the circumference at the pitch radius); and of Fig. 8, which shows a section along the thread helix.

Let t = number of threads in worm or hob;
f = number of flutes or gashes;
L = lead of thread;
L_f = lead of flutes;
d = pitch diameter of hob;
λ_t = lead angle of thread at pitch radius;
λ_f = lead angle of flutes at pitch radius;
k = number of flute intersections along one thread per revolution;
a_p = worm addendum;
b_p = worm dedendum;
a_h = hob addendum;
b_h = hob dedendum;
c = bottom clearance;
β_t = top rake angle;
r = relieving cam rise.

Then, referring to Fig. 7, it can be seen that actual number of flutes f = number of flute intersections along AB and = number of flute intersections along BD, so that

$$k = f\left(\frac{BC}{BD}\right)$$

But

$$BD = AB\left(\frac{\sin BAD}{\sin BDA}\right)$$

$$= \pi d\left(\frac{\sin \lambda_t}{\sin (\lambda_t + \lambda_f)}\right)$$

whence

$$k = f\left(\pi d \sec \lambda_t\right)\left(\frac{\sin\left(\lambda_t + \lambda_f\right)}{\pi d \sin \lambda_f}\right)$$

$$= f\left(1 + \tan \lambda_t \cot \lambda_f\right) \qquad (7)$$

As suggested, it is usual to make the angle λ_f complementary to the angle λ_t to obtain the strongest cutting profile. If this is done,

$$k = f \sec^2 \lambda_t \qquad (8)$$

The relations between the hob and worm addendums and dedendums are given by the following equations:

$$a_h = a_p + c \qquad (9)$$

$$b_h = b_p - c \qquad (10)$$

so that

$$a_h + b_h = a_p + b_p$$

It is recommended that, as shown in Fig. 8, the helical length of the tooth, measured around the pitch cylinder, should equal $(a_h + b_h)$, while that of the flute, also measured around the pitch cylinder, should equal $0.6\ (a_h + b_h)$.

Thus, the pitch of the flutes along the thread helix is $1.6\ (a_h + b_h)$, so that (Fig. 7)

$$\pi d \sec \lambda_t = 1.6\ (a_h + b_h)\, k$$

or

$$\pi d \sec \lambda_t = 1.6\ (a_h + b_h)\ f \sec^2 \lambda_t$$

Therefore

$$f = \frac{\pi d \cos \lambda_t}{1.6\ (a_h + b_h)}$$

$$= \left(\frac{2d \cos \lambda_t}{a_h + b_h}\right) \text{approximately} \qquad (11)$$

The actual value of f chosen for the hob should be the nearest whole number to that given by Equation (11), unless this figure has a factor common to t, in which case the nearest whole number not having a common factor should be chosen. The actual number of reciprocations of the relieving tool per revolution of the hob should be equal to k, as given by Equation (8), but is limited by the available change-gears on the relieving lathe and the grinding machine. The nearest possible value should be chosen, and the lead angle of the flutes recalculated, with the aid of Equation (7), to suit this chosen value of k. This will insure that the flutes are as nearly at right angles to the thread as is possible, thus providing a tooth form of maximum strength, consistent with satisfactory set-up of the hob in the relieving lathe. As shown in Fig. 8, the gash depth is made equal to $1.2\ (a_h + b_h)$, while the front face of the tooth is made radial.

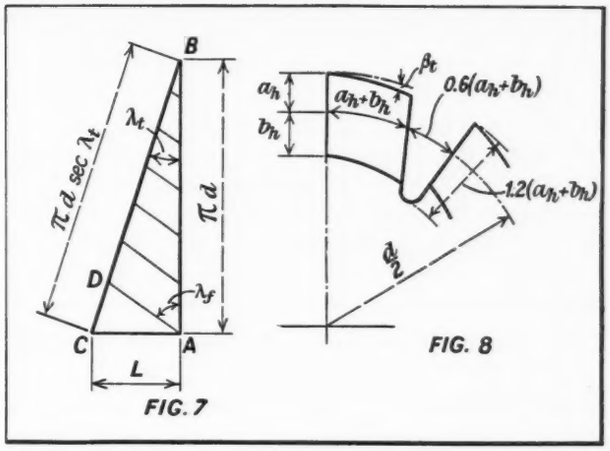


FIG. 7 FIG. 8

Fig. 7. Development of hob pitch cylinder
Fig. 8. Details of hob thread

The rise of the relieving cam r is given by the following:

$$r = 1.6\ (a_h + b_h)\left(\frac{d + 2a_h}{d}\right)\tan \beta_t \qquad (12)$$

where $\beta_t = 8$ degrees usually, the angle varying slightly to suit the available relief cams.

The same cam is used for relieving the flanks of the teeth, as well as the tops, the relief being in a radial direction.

A straight hob is usually employed as a roughing hob, being followed by a finishing hob of the serrated type. In these circumstances, the thread of the straight hob is made thinner than that of the serrated hob by about 0.010 inch per inch of axial pitch.

The face length of a straight hob should be not less than $\left(F_p + \frac{L}{f}\right)$, where F_p is the face length of the worm. On the other hand, the over-all length of the hob should be kept as short as possible to reduce operating stresses and deflection, having due regard to the necessity for adequate clearance between the worm-gear and the housings of the hob bearings. In this connection, an allowance should be made for the small amount of tangential feed needed to give a good finish to the worm tooth profiles. The minimum tangential feed that will give satisfactory results is $\frac{L}{f}$.

It should be noted that the sharpening of a straight hob inevitably causes a change in the dimensions. Such a hob is, therefore, unsuitable for finishing cuts, and should be limited in use, as already stated, to roughing cuts.

A taper hob should be used for roughing work whenever possible. That is to say, it should be used whenever the tangential feed essential to

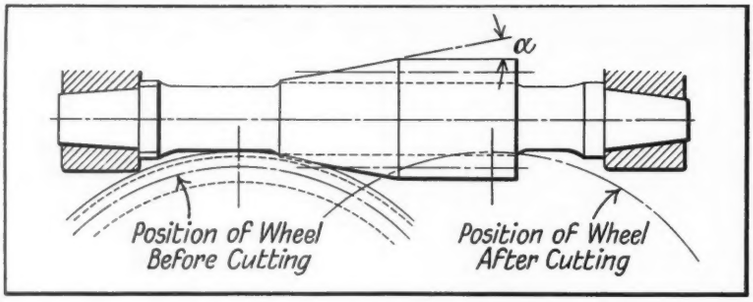


Fig. 9. Taper hob in mesh with worm-gear

the use of such a hob does not result in such an excessive distance between the hob bearings as might lead to undue bending of the hob under load. A taper hob retains its sharpness longer than a straight hob, since, due to its tangential feed, the cutting load is spread over many more teeth.

The taper angle α of the hob (see Fig. 9) should be as small as possible, consistent with a reasonably short over-all length, and should not be greater than 10 degrees. The straight portion following this taper portion should be about equal to 0.75 F_p in length. The teeth of the taper portion of the hob should be thinner, by about 0.020 inch per inch of axial pitch, than those of the straight portion at a corresponding radius.

The teeth of a taper type hob are designed in the same manner as those of a straight hob, the only difference being that the top portion of the thread is removed at the small end. The over-all length of the hob between bearings should be such as to permit the hob to take up the positions relative to the gear shown in Fig. 9, without the gear fouling the hob bearing housings.

After a worm-gear has been roughed out with a taper hob, it is usually finished by a serrated hob. It is necessary, in consequence, for the teeth at the straight end of a taper hob to be thinner than those of the serrated hob by 0.010 inch per inch of axial pitch. A taper hob changes in size when sharpened, the same as a straight hob, so that its use is restricted to roughing cuts.

A serious fault experienced with straight and taper hobs, as previously described, is the change of radius inevitably caused by sharpening the hob teeth. This renders them comparatively useless for any operation other than roughing. It is with this fault in mind that serrated hobs are designed and used. A serrated hob is a straight hob, and is used for finishing cuts only. The threads are not gashed right through, but have a series of radial serrations along their length, the pitch of these serrations along the thread being about one-third of the tooth depth. The thread has no top or side relief whatsoever, so that, except for the serrations, the hob is identical in form with the worm that is to mesh with the gear. The cutting edges consist of lands approximately 1/16 inch wide, these lands being ground in the same manner as the thread of a worm.

A serrated hob has clearance in the roots, so that it does not produce a throat on the gear, like other full hobs. It is fed into the worm-gear radially until it is at full depth, and is then traversed tangentially for a short distance to improve the surface finish of the gear tooth flanks. The face width and over-all length of a serrated hob are similar to those of an ordinary straight roughing hob.

The hobs described are essentially single-purpose tools, that is, they are designed for roughing or for finishing, according to their type. It follows, therefore, that two such hobs are needed to cut a worm-gear. Consideration of the time to be saved by the use of a combination roughing and finishing hob leads to the conclusion that such a hob should be employed whenever possible.

The roughing portion of a combination hob may be of the straight or of the taper type. The finishing portion may be of the serrated type or it may be similar to a straight roughing hob, except for the fact that a land approximately 1/16 inch wide is left on the tooth flanks and top at the cutting edges, so that sharpening of the hob does not alter the size of the teeth nor the diameter of the finishing portion. Whatever the form of the finishing portion of the hob, the flutes are continued right through it to simplify manufacture and sharpening.

If the roughing portion of a combination hob is of tapered form, then the hob is fed tangentially right across the gear. If, however, it is of straight form, then the roughing end is fed radially, until it is at full depth, and the finishing portion is then traversed tangentially.

In general, a worm-gear hob is made integral with its arbor, as shown in the illustrations. Such a hob, in normal sizes, is much stronger than a bored hob. For very large hobs, however, it is found to be more economical, and just as practical, to use a bored design.

The hob forging is of high-speed steel, the stages of manufacture being as follows:

The forging is turned to the correct size, and the thread is roughed out, either by chasing in a lathe or by milling on a worm milling machine, care being taken to leave an adequate grinding allowance on the flanks of the thread. The flutes are then gashed out with a formed milling cut-

ter, the thread flanks are relieved on a relieving lathe, and the hob is hardened throughout to a minimum hardness of 63 Rockwell C. The threads are then ground on a worm-grinding machine to the finished thickness and to the correct form. This operation leaves a land on the cutting edge, which is removed by grinding on a relief grinding machine. The tops of the teeth are relieved in the same manner.

A forging for a serrated hob is turned to size, and the thread chased or milled, as described. The serrations are then produced by slotting. After hardening the hob, the thread flanks are ground to size and form on a worm-grinding machine, and the hob is ground on the outer diameter.

The profile accuracy is checked by traversing the hob with a helical motion, corresponding to the lead of the threads, past a stylus which is movable in a straight line, offset at the base radius in the case of an involute helicoid thread, but passing through the axis in the case of a worm having a straight-sided thread in an axial section.

A hob of any type other than the serrated type needs resharpening after cutting about two hundred phosphor-bronze worm-gears, although this figure varies considerably, being dependent on the type of hob used and the feed. Sharpening is carried out by grinding the cutting sides of the flutes with a straight-sided grinding wheel. A hob can be resharpened until the tooth length is one third the original length before the risk of failure by breakage is serious. Unfortunately, sharpening of the hob causes a reduction in diameter, and this means that the gear teeth are of incorrect form. This is of little significance in the case of a roughing hob, but is very important in a finishing hob. To overcome this fault as far as possible, it is recommended that the hob be made over size when new, so that the nominal diameter is reached when one-half of the hob life has expired, this being similar to the practice followed in connection with hobs for cutting spur and helical gears.

In the case of a combination hob, where most of the wear takes place at the roughing end, it is good practice to sharpen the teeth by grinding the flutes to a slightly different lead from the nominal, so that more material is removed from the roughing end without any appreciable modification in the size of the finished end. If the teeth at the finishing end are provided with lands, the size remains constant for a considerable period.

Serrated hobs can be sharpened only by regrinding the flanks like a worm, but this inevitably involves a modification in size. However, serrated hobs have an amazingly long life without resharpening, especially if the roughing hob is kept in good condition.

The final installment of this series will deal with contact conditions between mating worms and worm-gears and will describe hob modifications that correct faulty contact. Design schedules for hobs will be outlined and detailed numerical examples given.

* * *

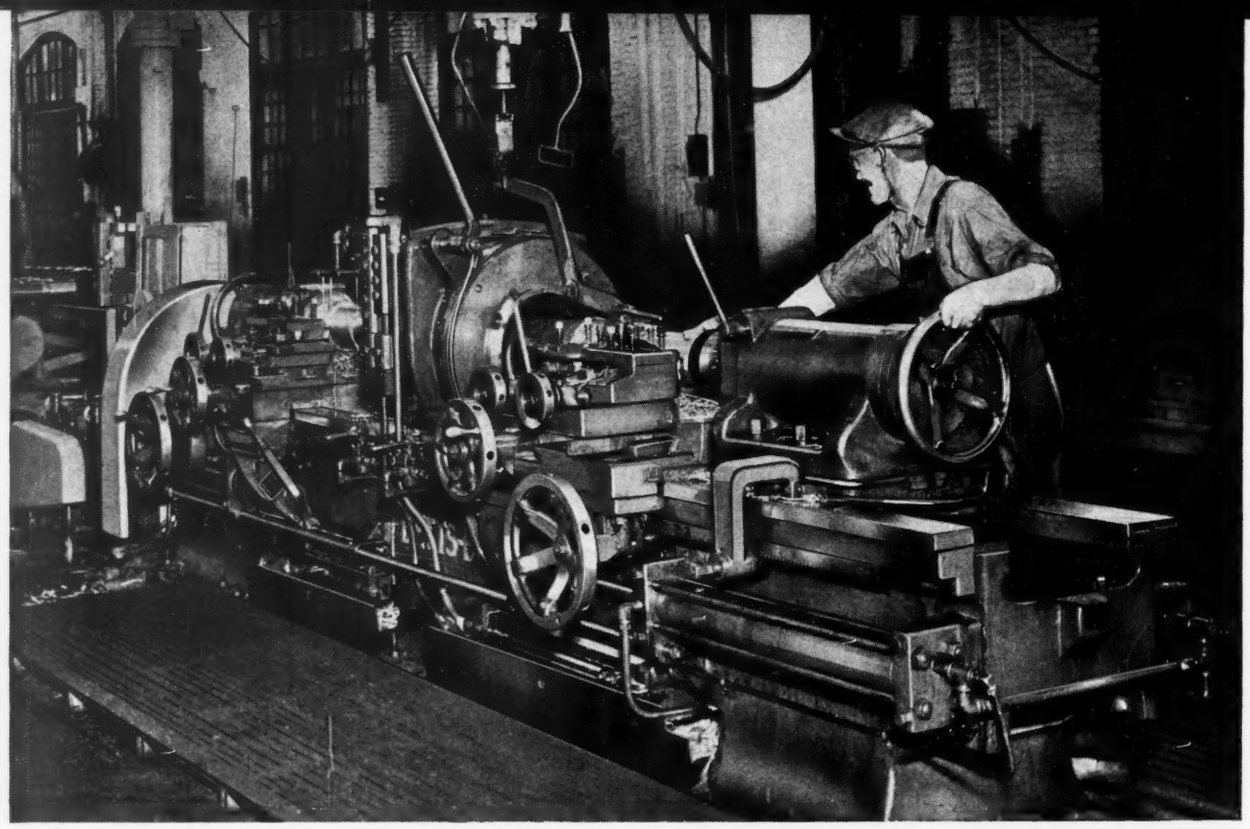
Metal Rod and Flat Stock Calculator

Metal rod and flat stock requirements can be determined directly from blueprints or a sample piece of metal with a new slide-rule type calculator. The device computes the amount of rod and flat stock required for producing parts of various shapes and sizes, in any length.

With a single setting, rod stock from 1/8 inch to 3 inches in diameter, of bronze, brass, steel, and aluminum, in square, hexagonal, and round shapes, can be calculated. Requirements for copper, brass, steel, and aluminum flat stock, 0.003 inch to 3 inches thick, can also be determined. Pounds of stock required per thousand pieces are read directly on the rule.

The instrument is made of Vinylite plastic rigid sheet, which has exceptional dimensional stability and is resistant to moisture, grease, oil, and ink. It is manufactured by H. R. Potter Co., P.O. Box 318, Montclair, N. J.

Device for calculating rod and flat stock requirements



Tooling Designed for Turning Railway Car Axles

Special Tooling Set-Ups Used at American Car and Foundry Co. for Turning and Burnishing Railway Car Axles to a High Finish at Rapid Production Rates

By EDMUND A. WATSON
General Improvement Engineer
American Car and Foundry Co.

RAILWAY car wheels and axles require great strength and durability to withstand the strains imposed on them by heavy loads and high speeds. Not only are large sums of money involved in the event of a failure, but, more important, human lives are endangered. For these reasons, a high standard of quality must be maintained in manufacturing these vital parts. At the same time, the current need for railroad equipment makes it necessary to turn out the axles and wheels at rapid production rates.

To accomplish this purpose, the American Car and Foundry Co. has developed a number of interesting tooling set-ups and methods. These are designed to permit close control over speeds and feeds and provide greater accuracy with less operator fatigue.

One of the most important operations performed on axles is turning the wheel seat *A*, the dust guard seat *B*, and the journal *C*, Fig. 1. This work is done in special double-end, center-drive Betts lathes, such as shown in the heading illustration. A battery of four lathes is employed, two being used for semi-finish-turning and the other two for finish-turning.

Axle forgings, made of S A E 1040 steel and rough-machined by the supplier, are loaded and unloaded at the lathes by specially designed self-supporting jib cranes. Although the axles weigh approximately 1100 pounds, they are handled easily and quickly by means of these cranes, so that operator fatigue is reduced to a minimum. As a result, each operator can devote his full energy to maintaining high quality production.

One of the outstanding features of the semi-finish-turning lathes is the new type of tool-block used. This block, shown in Fig. 1, positions each

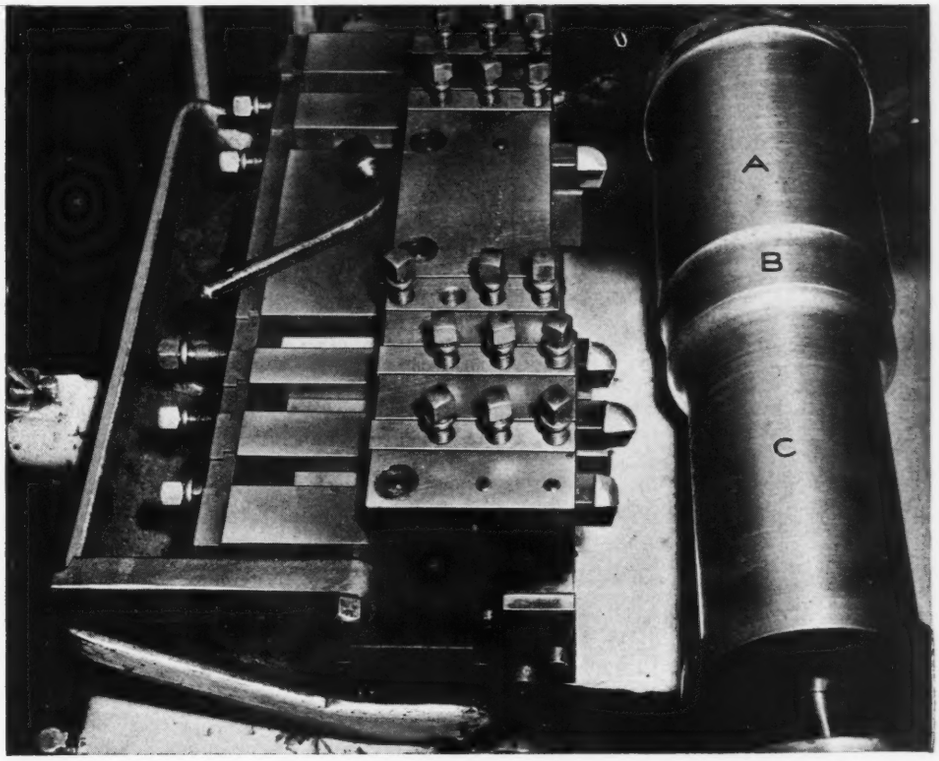


Fig. 1. Tools employed in a double-end, center-drive lathe for semi-finish-turning the wheel seat (A) of an axle, the dust guard seat (B), and the journal (C)

of several gage-ground tools in the exact location required relative to the work for turning different diameters so that all dimensions can be duplicated without measurement by the operator. Thus the journal, dust collar, and wheel seat lengths, as well as the radii of the connecting fillets, are all held uniformly to specified dimensions. The operator only has to adjust the movement of the cross-slide for turning to the proper diameter.

Passages are drilled through the tool-block to direct the cutting compound to the cutting edges of the high-speed steel tool bits, as shown in Fig. 2. This insures a constant and uniform flow of coolant exactly where it is needed.

The tools used in this set-up are ground to obtain proper clearances and profiles by the use of special jigs on double-end Ex-Cell-O tool grinders, Fig. 3. This equipment is used by trained operators in the grinding room to keep the lathes constantly supplied with sharp tools, thereby relieving the lathe operators of this responsibility and insuring uniform quality of tools.

To provide as good a surface finish as possible for subsequent burnishing, close control must be exercised over diameter dimensions in semi-

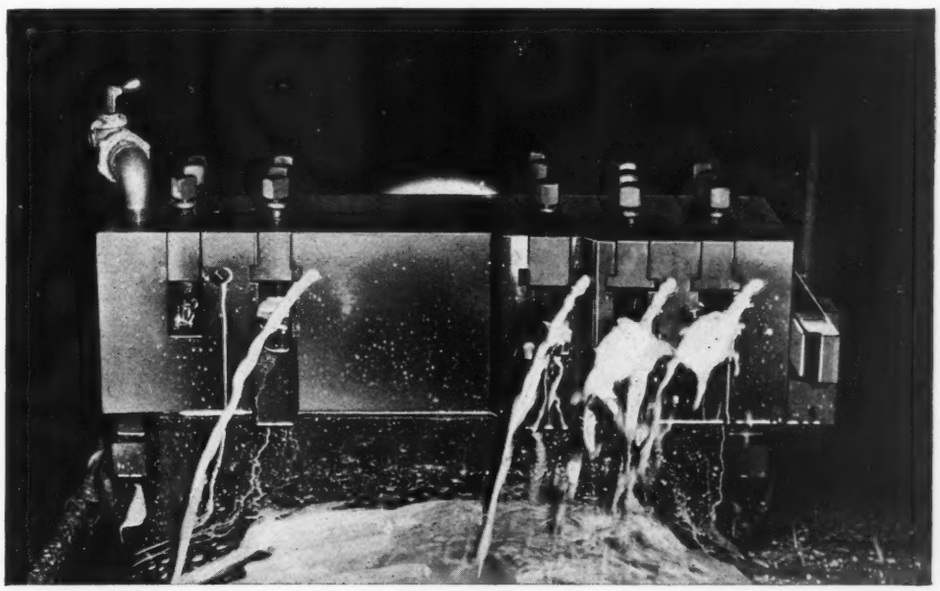


Fig. 2. Special tool-block, which is drilled to provide passages through which coolant flows directly to the cutting edges of the tools

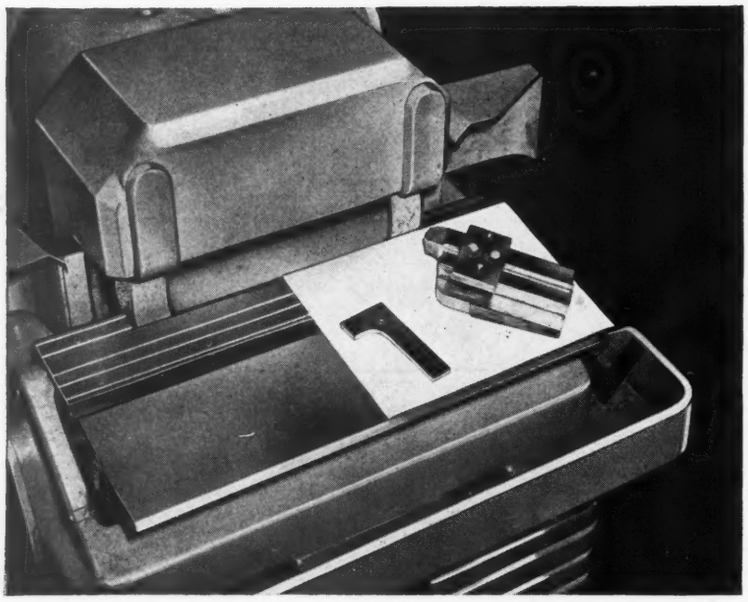


Fig. 3. To obtain tools uniformly ground with proper clearances and profiles, gages and jigs are employed in tool grinders operated by trained personnel

finish-turning. Snap gages, periodically checked with master gages, are used for this purpose.

"Clamp-on" tools, Figs. 4 and 5, especially designed to facilitate tool-room grinding, have been developed for finish-turning the axles. It can be seen that the top rake angle of these tools is built into the tool-holder and that the cast-alloy tool bit is ground to obtain a slight shearing action on the chip, so that the chip is rolled away after it is cut. These tools provide the finishes required for journal burnishing and for the fit needed between the wheels and wheel seats. By careful control of the amount of stock removed, surfaces susceptible to good burnishing are obtained.

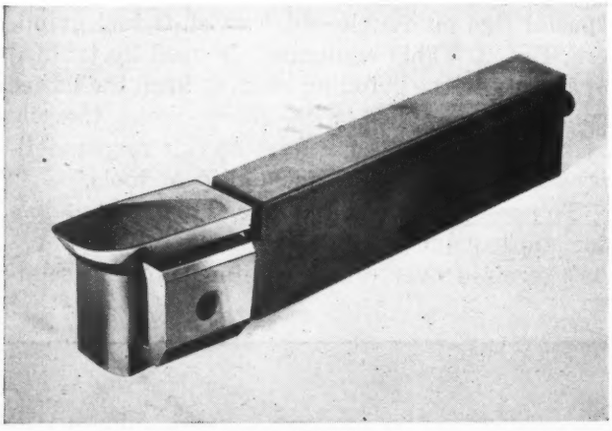
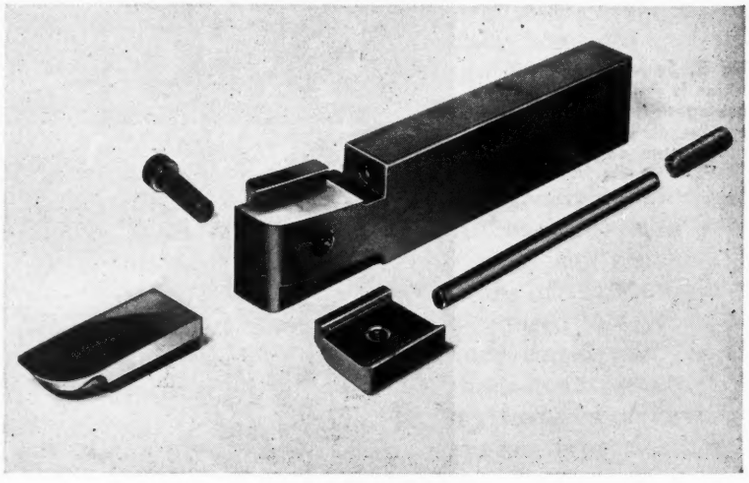


Fig. 4. (Above) Specially designed "clamp-on" tool used in finish-turning axles to the proper finish

Fig. 5. (Right) Finish-turning tool disassembled to show construction. Note built-in top rake angle provided in tool-holder

The lathe set-up used in finish-turning operations is illustrated in Fig. 6. It is interesting to note that the floor-to-floor time for either semi-finish- or finish-turning of both ends of an axle having, say, a 5 1/2-inch diameter journal 10 inches long is approximately seven minutes. Of course, the time varies for axles of different sizes.

The burnishing operation previously mentioned is performed on the journal surfaces to provide the high finish essential to avoid picking up threads from the packing in the journal box. Burnishing is accomplished in a lathe with the set-up shown in Fig. 7. Here it will be seen that the axles are driven from the ends, since the work load is not great and therefore requires only light end pressure. Centering and chucking



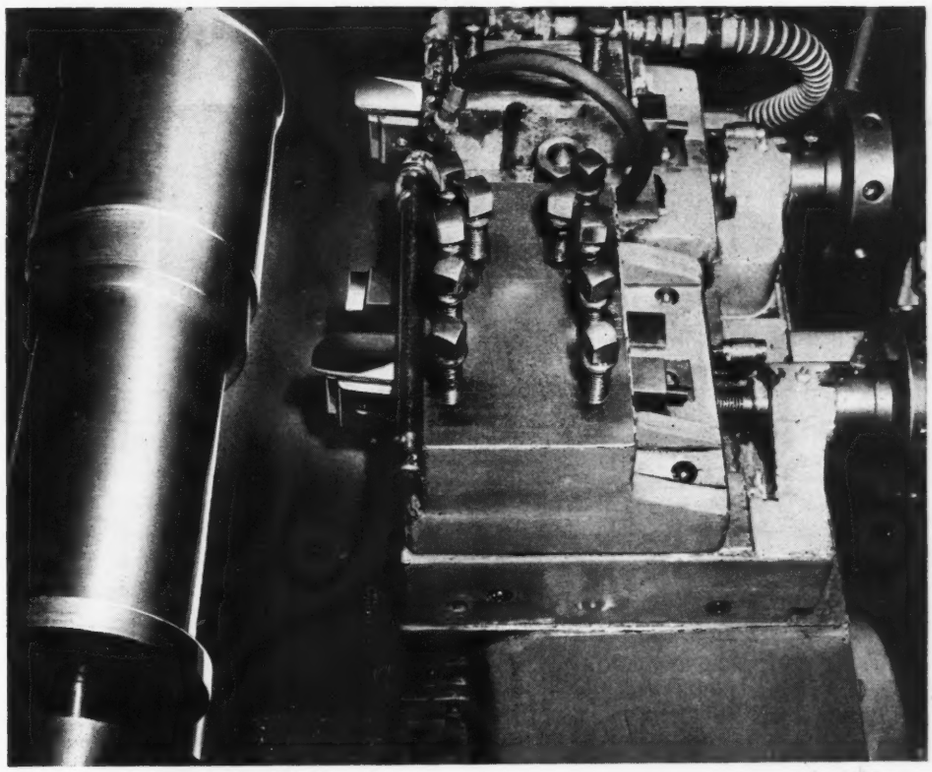


Fig. 6. Tool set-up used in double-end, center-drive lathe for performing finish-turning operations on both ends of railway car axles

are effected by hydraulic pressure. Stellite burnishing rolls are employed at both sides of the lathe to apply pressure simultaneously. They are moved laterally through the use of a rack and pinion, engaged and disengaged by a slip clutch.

Other operations performed to insure the required high quality of wheels and axles include boring the wheels to close tolerances in special vertical boring mills, pressing the wheels on the axles under precisely controlled hydraulic pressure, and numerous inspection procedures. Close supervision and careful attention are given to quality control and ease of handling throughout the manufacturing process.

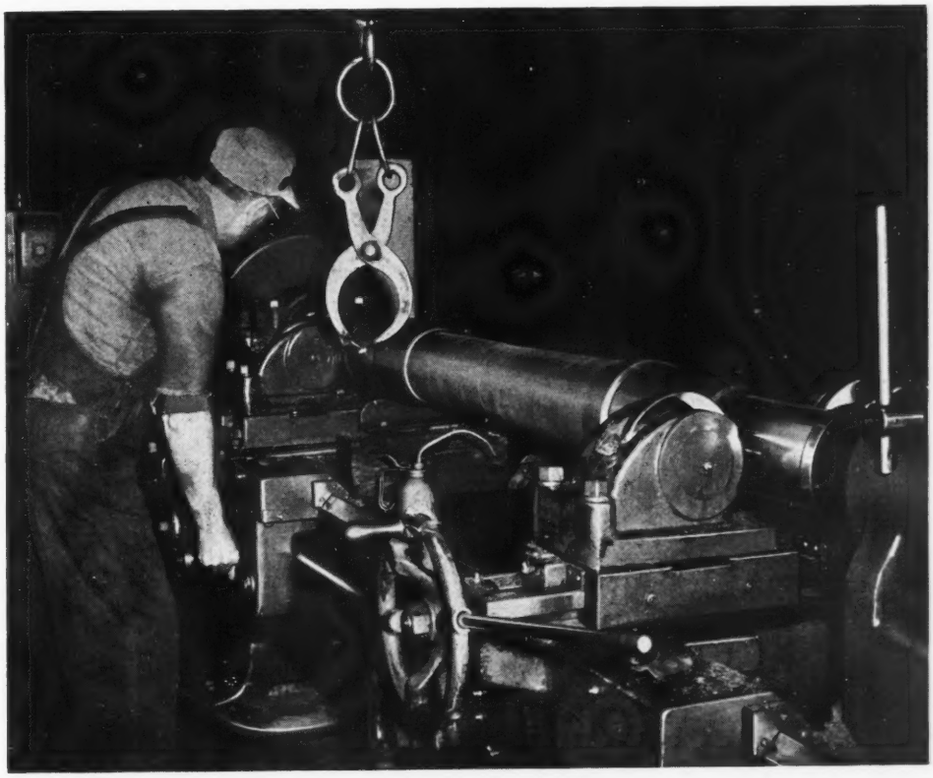
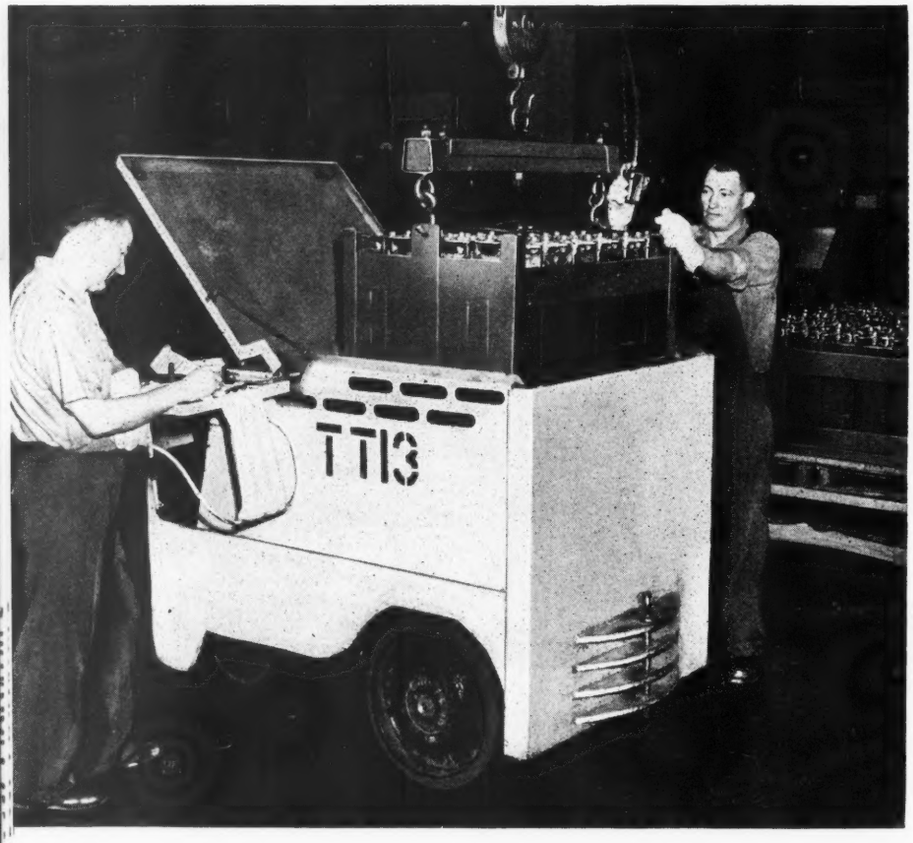


Fig. 7. Lathe set-up employed for burnishing journals of axles to a high surface finish. Two Stellite rolls apply pressure simultaneously from both sides

Producing Storage Battery



Cold-Reducing Hot-Rolled Steel, Continuous Tube Forming, Perforating of Steel Strip with Circular Dies, Broaching, Welding, and Producing Flakes of Pure Nickel are Typical of the Operations in Storage Battery Manufacture Requiring Special Tools and Machinery

By
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Vice-President
Thomas A. Edison, Inc.

NICKEL-IRON-ALKALINE storage batteries are made in a wide range of types and capacities at the West Orange, N. J., plant of Thomas A. Edison, Inc. These batteries are used as a source of operating power for such equipment as industrial trucks, mine lamps, mine locomotives, and shuttle cars, and as a source of standby power for railroad passenger car lighting and air-conditioning, multiple-unit car controls on subways and other electrified railroads, railway signals, and various purposes in which long life and dependability are desirable for reasons of economy of operation or are essential from the standpoint of safety.

These characteristics are, to a large extent, the result of the steel cell construction employed. The active materials used in the cells of nickel-iron-alkaline batteries are nickel hydrate—the positive electrode—and finely divided iron oxide —the negative electrode. The electrolyte is an alkaline solution of potassium hydroxide, which has the natural property of acting as a preservative of ferrous metals, thus permitting the use of steel-plate construction, including finely perforated steel tubes and pockets that retain the active materials.

The use of steel for these parts and such structural components as cell containers, grid frames, and electrodes provides a battery construction that will stand up under shocks, vibration, and hard usage in general. These parts are quickly and accurately produced in large quantities by utilizing special machines, jigs, fixtures, and other equipment specifically designed for the purpose.

One of the most interesting processes employed in this plant is the production of the perforated steel tubes that are packed with alternate layers of nickel hydrate and nickel flake to insure conductivity within the active material. Production begins with the cold-reducing of hot-rolled steel in the Steckel mill illustrated in Fig. 1. This machine contains two reversing, power-driven reels and a four-high stand of free rolls. When the final reduction has been attained, the finished coils are placed in a slitter adjacent to the cold-rolling mill and sheared into narrow strips.

Reels of cold-rolled strip are then continuously perforated by feeding the stock between circular male and female dies in machines of the type illustrated in Fig. 2. These dies produce 550 perforations per square inch. One operator can attend six machines, as they require only the

Parts with Special Equipment

loading and unloading of reels. A light box, over which the strip passes after leaving the dies, affords an easy means of visually inspecting the quality of the perforations.

Small burrs are automatically removed from the perforated strip by grinding. In the machines used for this work, the stock is unwound from one reel, passed over the grinding wheel, and then rewound on another reel. A large volume of coolant is used for this operation. The coolant is carried from the work to a magnetic separator, which removes the metal particles, then to a filter storage unit, and finally, back to the grinder to be used over again. After the perforated strip has been dried in an oven, it is passed through another specially built machine where the final cleaning is automatically accomplished by wire brushes.

These operations are followed by a nickel-plating process, in which the strips, winding around rollers in the plating tanks, are continuously plated. In order to weld the nickel firmly to the steel, the plated strips are annealed in a reducing atmosphere of hydrogen. This results in a bond so firm that the strip can be twisted and folded without separation of the nickel plate. The pockets that contain the negative active material in the batteries are made from steel strip processed in approximately the same manner, except that 1900 perforations per square inch are provided.

The strips are next formed into tubes in automatic machines especially designed for this work, Fig. 3. Here the perforated strip is first fed to rollers from a reel located at an angle to the axis of the machine. These rollers turn one edge of the strip down and the other edge up, so that the two edges will lock together when the strip is twisted into a cylinder. At the next station, a guide directs the strip onto a reciprocating mandrel in alignment with the axis of the machine, which produces a twist preparatory to forming the cylindrical shape. This shape is produced as the mandrel carries the twisted strip between forming rollers that close the edges together.

An oscillating and reciprocating feed-head containing a small chuck that opens and closes as the head reciprocates pulls the formed tube on the mandrel to a swaging die where the edges are swaged tightly together before the tube is passed on to a cut-off wheel that cuts it to the required length. Approximately fifty tubes per minute are produced in this manner, with one operator attending three machines.

It is interesting to note that some of these machines are set up to form the tubes with a right-hand spiral, while others produce a left-hand spiral. The tubes are twisted both ways so that they can be loaded in grid frames with left-hand and right-hand spirals alternately adjoining, thus providing greater resistance to torsion resulting from expansion and contraction.

Fig. 4 illustrates one of the machines built to insert caps in one end of these perforated tubes. Tubes and caps are fed to the machine from individual hoppers. Two reciprocating plungers at the bottom of the feed tracks act simultaneously. One picks up a cap and inserts it in one end of a tube, while the other enters the opposite end of the tube to support it and to back up the cap. One operator attends two of these machines, each of which caps 6600 tubes per hour.

The tubes are next assembled in eight-cavity jigs, as shown in Fig. 5, and placed in machines for packing them with the positive active material and nickel flake. Nickel hydrate flows from a hopper on one side of the machine to a track that leads to the jig. A hopper on the other side

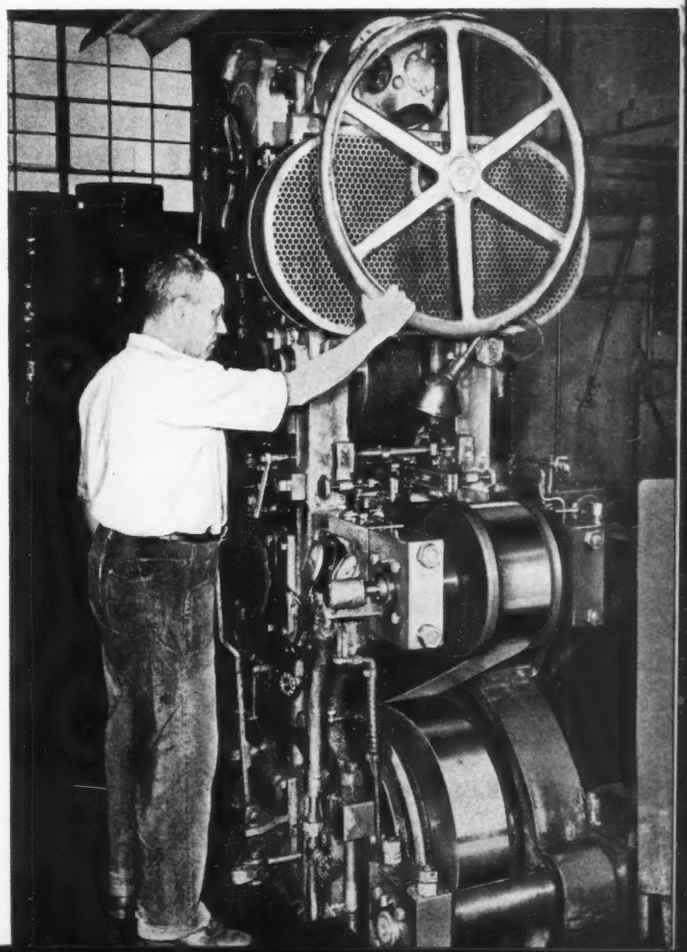


Fig. 1. Steckel rolling mill in which hot-rolled steel is cold-reduced to size within tolerances of 0.0002 inch

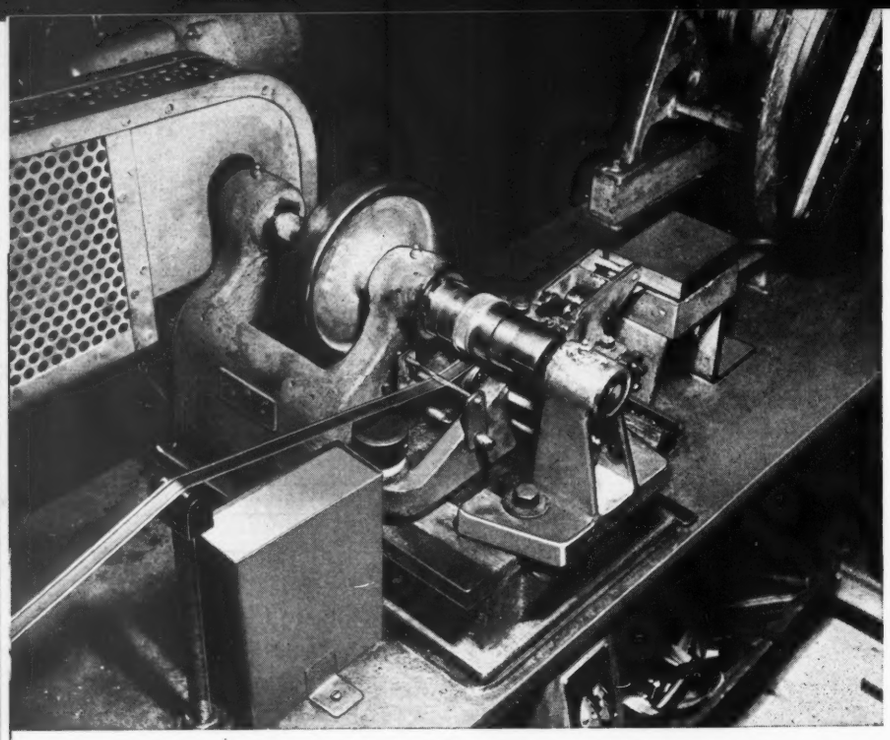


Fig. 2. Continuous perforating of cold-rolled steel strip is accomplished between circular dies

of the machine provides a flow of nickel flake to another track directed to the same point over the jig. The flow of material from each of these tracks is stopped, in turn, by a reciprocating slide, so that a measured layer of first one material and then the other enters the tubes. Eight pistons are timed to rise and drop with the reciprocating action of the slide, so that the material is packed in the tubes as they are filled. Approximately 630 alternate layers of active material and nickel flake are tightly packed in each tube.

The tubes are now inspected visually. After checking the tubes, the inspectors place them in boxes with the open ends all in one direction to facilitate the automatic reaming of these ends for the second cap. These caps are inserted automatically in much the same manner as the first caps, after which eight steel reinforcing rings are placed on each tube. The tubes are dusted with graphite in this operation to reduce friction while being pressed through the rings in automatic machines. Both tubes and rings are fed to the machines from hoppers.

Following this operation, both ends of the tubes are closed in automatic crimping machines. One operator attends three of these machines, each of which crimps the ends at the rate of eighty tubes per minute. The tubes are then loaded in grid frames after the closed ends and the spacing of the reinforcing rings have been inspected.

Pockets for the negative active material are formed and loaded in the unusual set-up illustrated in Fig. 6. Here perforated steel strip, which has been cold-rolled in the Steckel mill in the same manner as described for the tube ma-

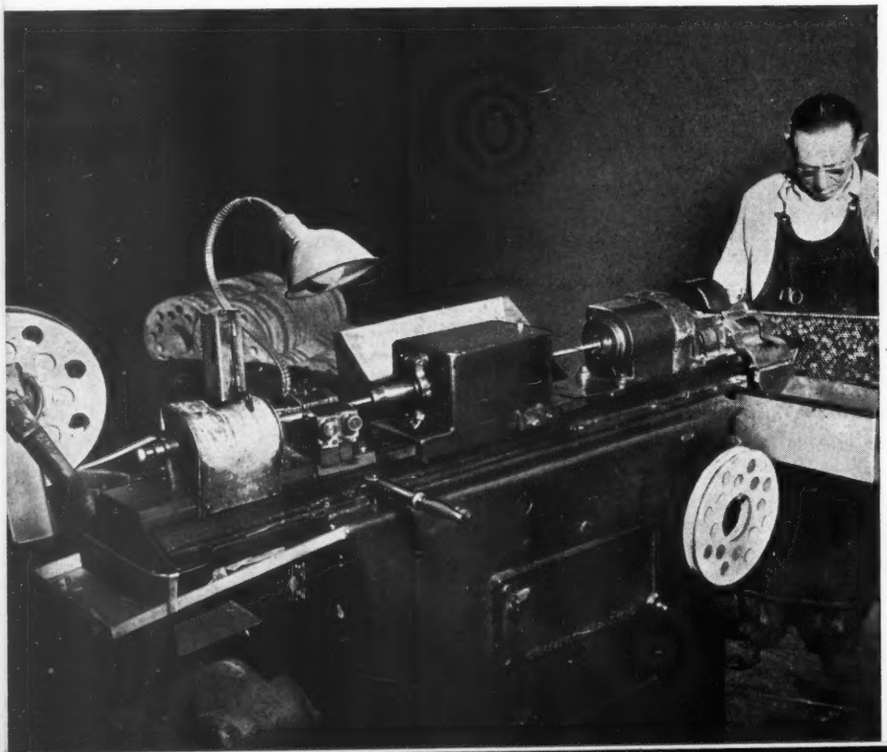


Fig. 3. Tubes that hold the positive active material used in nickel-iron-alkaline batteries are formed automatically and continuously in specially designed machines of the type shown

terial, is fed from a reel at the back of the machine to a plunger at the front. The operator places an empty mold having sixteen rectangular cavities into position under the plunger, which cuts the strip and folds it over double as it enters a cavity, leaving a short length extending above the cavity for closing the pocket after it is filled. As the strip enters the cavity, the edges are curled over to form the sides of the pocket.

The molds are automatically indexed to present each cavity to the plunger until the pockets are formed, after which they are moved to the powder loading station, where iron oxide is packed into the sixteen pockets in each mold. When the pockets are filled, the operator transfers the molds to a manually operated fixture in which the extending flaps at the top of the pockets are bent over to close them. Next the molds are placed in an ejector equipped with air-operated fingers that remove the pockets from the cavities.

Approximately 2000 pockets are produced every hour by one operator at each of these stations. Hydraulic presses are then used to press the pockets into grid frames, locking them tightly.

Cold-rolled steel cell containers are made from 20-gage (0.036 inch) stock. The two opposite edges are curled over in a press, after which the parts are nickel-plated. The deep-throated 20-ton press illustrated in Fig. 7 is one of several used to form these containers. Here a sheet is placed under a rectangular center die with one edge in contact with locating stops on outboard arms at one side of the press. As the ram is lowered, two right-angle bends are formed in such a way that one side of the part is twice as long as the other. This side is then placed under the die with the folded side contacting the stops on the arms at the opposite side of the press, and a third right-angle bend is produced, forming a rectangular container with two open ends.

Rods at the front of the press actuate the die at the front, while the ram drives the die at the back, thereby providing equal pressure along its length. The opening between the rods permits the removal of the folded container after the third bend has been made. Various lengths of rods are used for different sizes of containers. Approximately 200 containers of the type illustrated are produced in one hour.

The containers are now automatically seam-welded along the open edge. Oxy-acetylene welding heads, using a reducing flame, are moved along tracks by means of a worm-gear drive, the work being clamped securely in stationary fix-

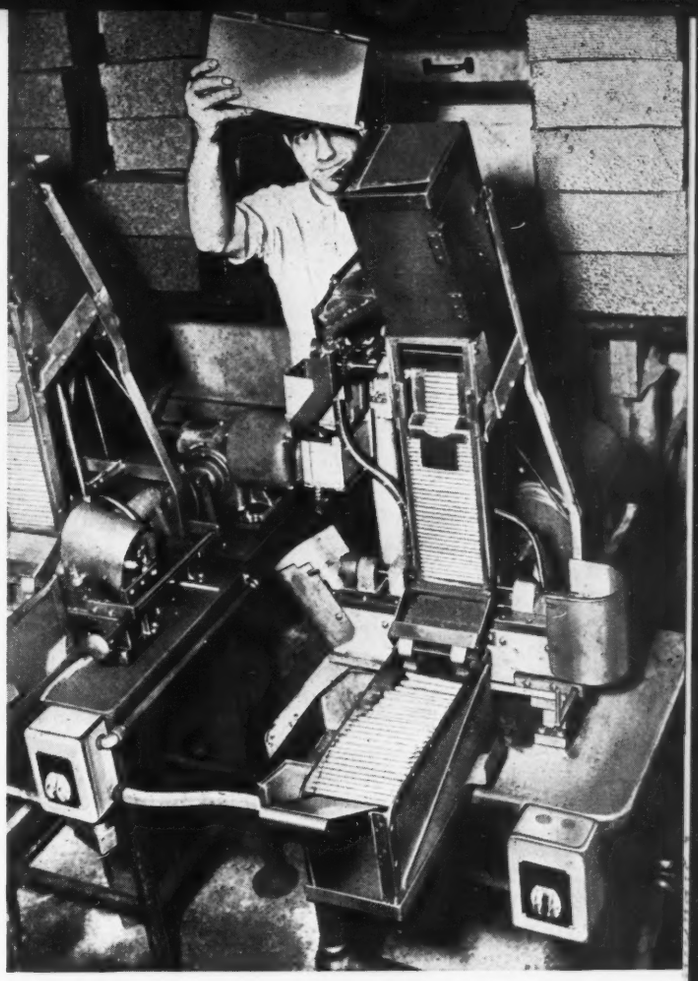


Fig. 4. In this special machine, 6600 caps per hour are automatically inserted in one end of the perforated tubes. Tubes and caps are fed to the machine from individual hoppers

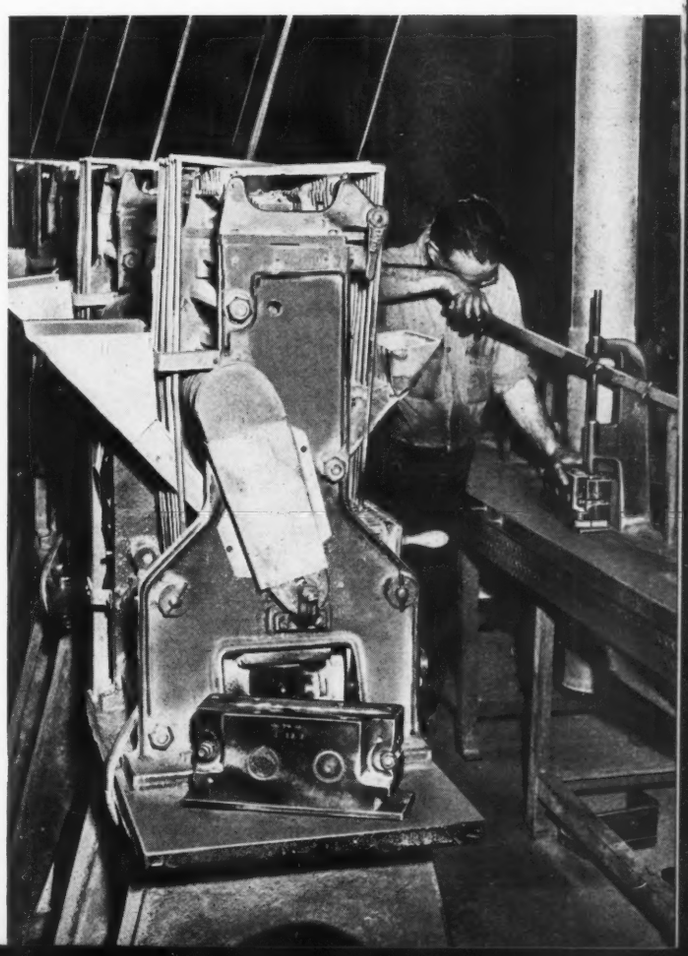


Fig. 5. Approximately 630 alternate layers of nickel hydrate and nickel flake are automatically packed in perforated tubes by means of an ingenious machine developed for this operation

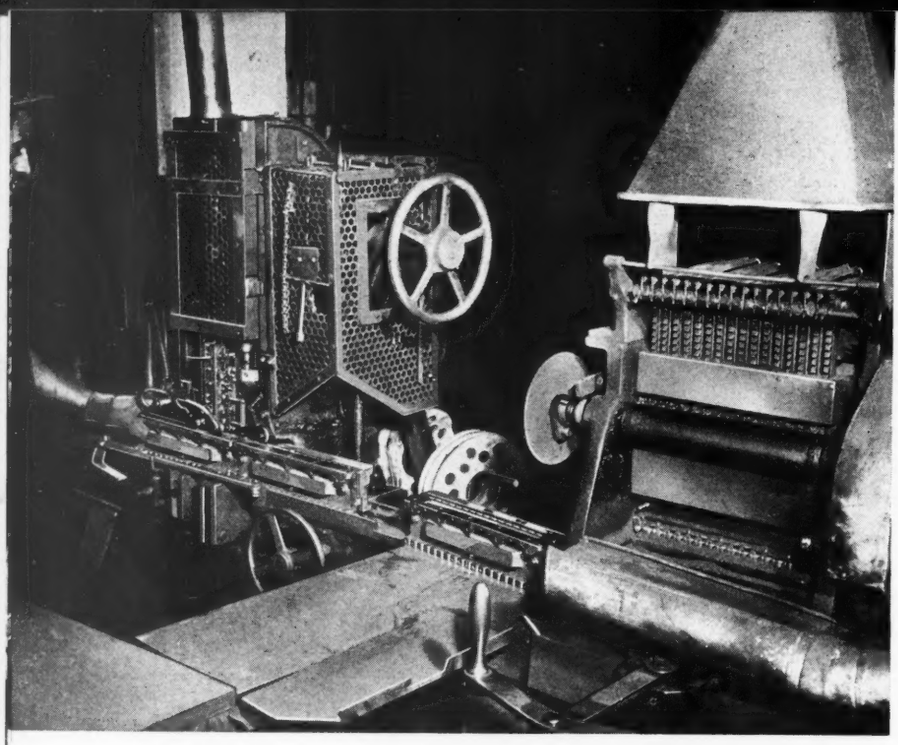


Fig. 6. (Left) Perforated cold-rolled strip is fed to the machine seen at the left in this set-up, where it is automatically formed into a pocket to hold the negative active material used in the battery. Loading of the pocket is accomplished in machine at right

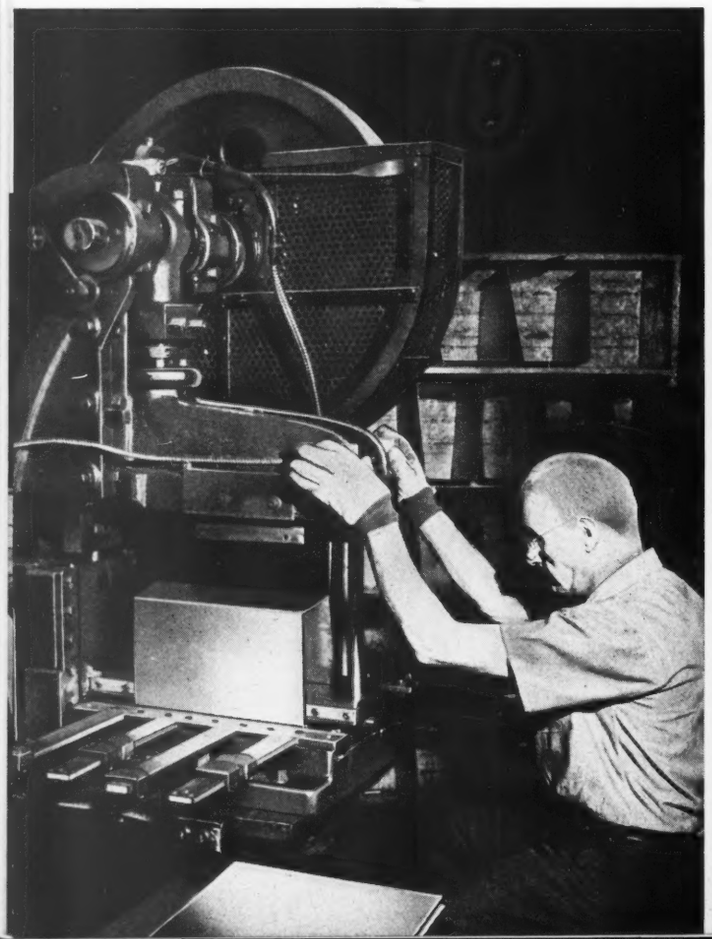
Fig. 7. (Below Left) To form cell containers, three right-angle bends are produced in nickel-plated cold-rolled steel sheet on the deep-throated 20-ton press illustrated

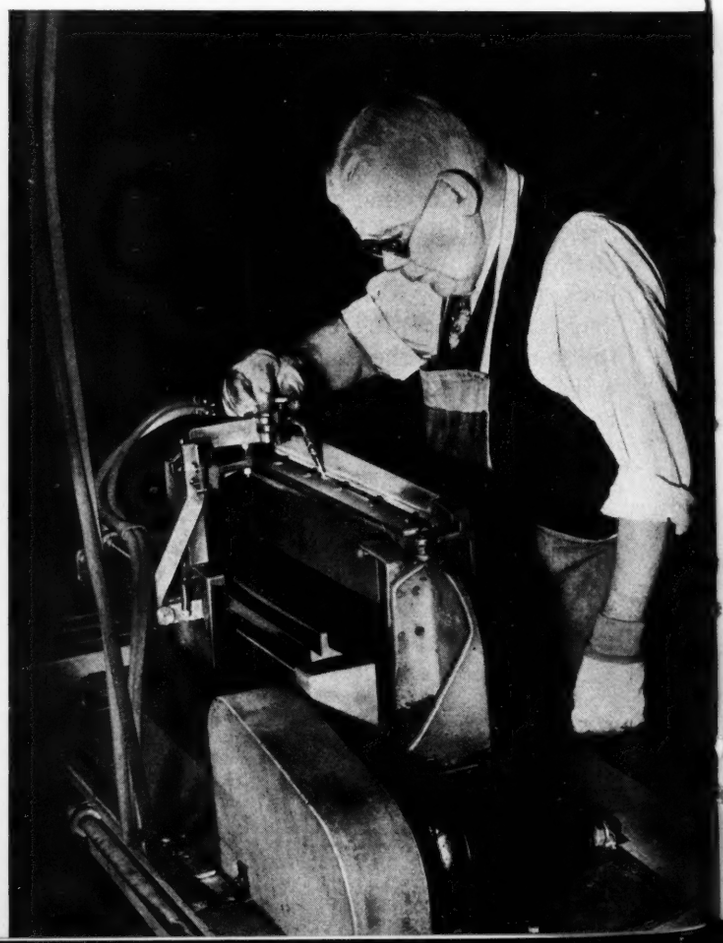
Fig. 8. (Below Right) Continuous, automatic seam-welding of the sides of cell containers is accomplished with oxy-acetylene welding head. Two units are attended by one operator

tures. Two automatic units such as the one shown in Fig. 8 are attended by one operator. Interesting fixtures are used for positioning the work in welding bottoms to these containers.

These fixtures, illustrated in Fig. 9, move all four sides and the corner radii of the container past the welding head. A rack around the bottom edge of the fixture is made with circular gear segments at each of the four corners and is driven by a pinion. The movement of the fixture is guided by a stationary locating pin in the table which engages a groove in the bottom of the fixture. This groove follows the contour of the container bottom, having radii in four corners, and is so located with respect to the rack that gear tooth engagement is constantly maintained.

After the fixture is carried past the welding head in a longitudinal direction to weld one side of the container, it swings through a 90-degree angle, moving radially with one of the circular gear segments in engagement with the pinion, thus continuing the weld at the corner radius. The remaining sides and corner radii are welded in the same manner. From 17 to 42 cell contain-





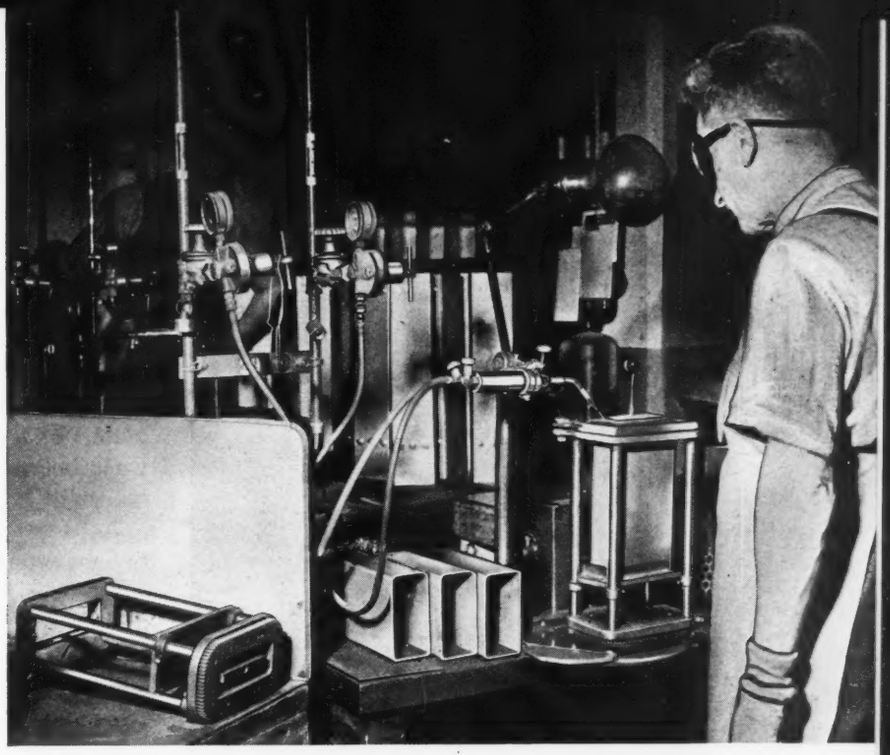


Fig. 9. In welding bottoms to cell containers, a special work-positioning fixture is used to carry all four sides and the corner radii under a stationary welding head

ers are welded per hour, depending on the size. The curled edges are fused together, no additional filler metal being necessary. After welding, the containers are plated again.

Another welding operation that utilizes interesting fixtures is the spot-welding of suspension bosses to the cell containers, Fig. 10. A special circular electrode is used for the operation illustrated, the bosses being delivered to the machine from a rotating drum hopper, which feeds them to the position in which they are to be welded.

At the machine, the bosses enter a fixture adjacent to the circular electrode, over the work. This fixture is pivoted by the operator to locate and hold a boss on the container while the weld is being made. From four to twelve bosses are welded in place on each container, depending upon its size, and production rates approximate forty containers per hour for the twelve-boss containers. After being welded, all containers are tested hydrostatically.

Other operations on battery components include the production of cold-rolled steel terminal poles of all sizes in automatic bar machines, followed by the broaching of flats on one end of the poles for assembling the grid frames in the cells. The broaching operation is illustrated in Fig. 11, where a 10-ton Footburt vertical broaching machine is shown removing 0.600 cubic inch of metal from a pole in a single pass. Air-actuated fixtures speed up the operation.

Grid frames, in which tubes and pockets are to be assembled as previously described, are blanked from coils of cold-rolled steel in a 300-ton Bliss inclinable punch press, using a compound die. This work is performed at the rate

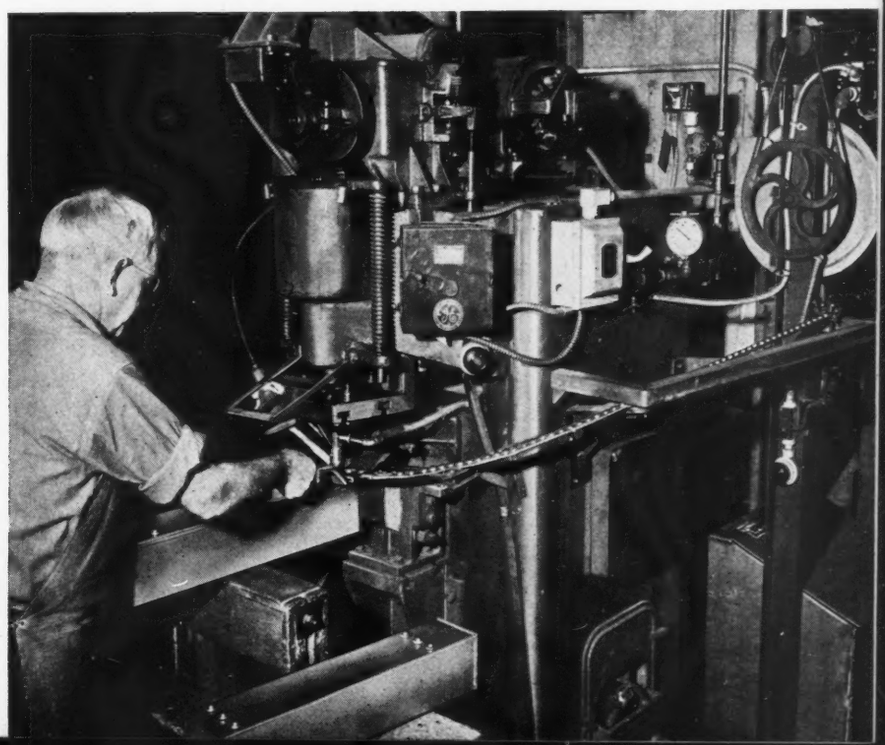


Fig. 10. A hopper feed is utilized to achieve high production rates in spot-welding suspension bosses to cell containers

Fig. 11. Vertical broaching machines are employed to produce two flats simultaneously on one end of cold-rolled steel terminal poles

of approximately fifty frames per minute. One of the most interesting operations performed in this plant is the production of pure nickel flakes, 1/16 inch square by 0.00004 inch thick. This process begins with a series of plating operations, using specially designed, automatic plating equipment, Fig. 12. These machines have ten cylindrical plating vats on each side of a water wash unit. An overhead crane carries ten steel cylinders from one set of vats, in which they are copper-plated, to the water wash, and then to the opposite set of vats, where they are nickel-plated.

They are then returned to the water wash and back to the first set of vats again, repeating this process until the cylinders have been copper-plated and nickel-plated 131 times. The water wash between each plating operation removes all traces of both copper and nickel solutions.

A bare minimum of copper plating is applied to separate nickel platings of 0.00004 inch thickness. The thickness of plating is accurately controlled by passing the current through a sensitive ampere-second meter, which automatically times the circuit controlling the crane drive. In this way, the cylinders are removed from the vats after precisely the right length of plating time. The cylinders revolve at a constant speed throughout the cycle to insure uniform plating.

Approximately 3 1/2 hours is required to complete the 262 platings, after which the sheets are stripped from the cylinders and slitted into 1/16-inch wide strips. These strips are then passed through shears which cut them into 1/16 inch squares. The squares are placed in a weak acid solution, the chemical reaction dissolving the copper without affecting the nickel. Copper sulphate is later reclaimed from the solution.

Separation of the nickel flakes from this solution is accomplished in a centrifuge, after which they are rinsed in water to remove all traces of the copper solution, centrifugally dried again, and then placed in racks over steam pipes for complete drying. After screening for size, laboratory samples are taken for analysis.

Fig. 12. Automatic overhead cranes are used to carry the work in this specially developed plating installation, where layers of nickel and copper are plated on steel cylinders as the first step in producing nickel flake

Two New Gear Materials

Abstract of a Recent Paper Presented before the American Gear Manufacturers Association by C. M. Schwitter, Development and Research Division, International Nickel Co., Inc. — First of Two Articles

TWO metals that have not been commonly employed for gears are Nitralloy N and ductile iron. The first of these two materials is an alloy steel generally manufactured to the chemical limits given in Table 1. It is simply a rather heavily alloyed version of the familiar S A E 4300 type, with no unusual features except the presence of about 1.25 per cent aluminum. When suitably treated, this alloy develops a nitrided surface which is tougher than that of other steels commonly employed for nitriding, although not quite so hard. It also develops a stronger core.

Table 1. Customary Chemical Limits for Nitralloy N

Carbon	0.20 to 0.27 Per Cent
Manganese	0.40 to 0.70 Per Cent
Nickel	3.25 to 3.75 Per Cent
Chromium	1.00 to 1.30 Per Cent
Molybdenum	0.20 to 0.30 Per Cent
Aluminum	1.10 to 1.40 Per Cent

The carbon content is rather low, compared to most gear steels used in the quenched and tempered condition, but its alloy content is high, and this results in end-quench hardenability characteristics of the kind illustrated below. Hardness at the quenched end is established by the relatively low carbon content; this hardness does not drop very much as the severity of quench is decreased because of the high alloy content, which produces a deep-hardening steel not unlike the S A E 4340 type. Such a steel can be expected to respond well to liquid quenching in heavy sections or to air quenching in small or medium sizes.

The mechanical properties of Nitralloy N in the quenched and tempered condition parallel those of S A E 4340. Also, the steel can be annealed for maximum machinability without presenting any special problems.

Recommended Procedures for Annealing Nitralloy N

Two procedures are recommended for annealing Nitralloy N, both involving austenitizing at 1500 to 1550 degrees F. Isothermal transformation may then be accomplished by cooling to 1225 degrees F. and holding at that temperature for eight hours, followed by furnace cooling to 1150 degrees F., and finally cooling to room temperature in air.

If preferred, continuous cooling transformation may be practiced, in which case austenitizing should be followed by cooling to 1300 degrees F. at any convenient rate, after which the rate should approximate 20 degrees F. per hour until the steel has reached 1150 degrees F. It should then be finally cooled in air.

Both cycles yield a hardness of about 217 Brinell and a microstructure consisting of ferrite and fine carbide spheroids, with some pearlite. In no instance, should the steel be cooled slowly below 1150 degrees F. because this will result in precipitation hardening.

End - quench hardenability curves for Nitralloy N and S A E 4340 steel

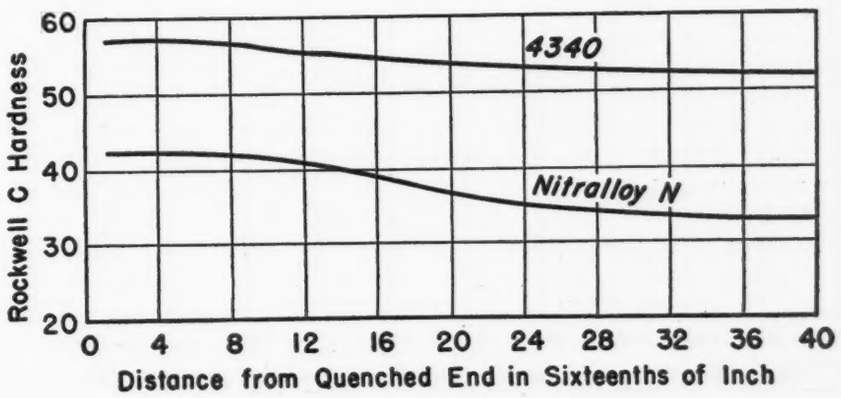


Table 2. Tensile Properties of Nitralloy N before and after Aging

Property	Before Aging	After Aging
Tensile Strength, Pounds per Square Inch	132,400	190,250
Yield Point, Pounds per Square Inch	114,600	180,000
Elongation, Per Cent in 2 Inches	22	15
Reduction of Area, Per Cent	59	43
Brinell Hardness	277	415

It is the precipitation hardening characteristic of this steel which is unusual. This is shown by Table 2. Properties as given in the column headed "Before Aging" were developed by conventional oil quenching from 1650 degrees F., followed by tempering at 1200 degrees F. The results are about what would be expected of any suitable alloy steel so treated. After an aging treatment is applied, however, it will be seen that the yield and tensile strength are sharply increased and the Brinell hardness is raised to 415. Elongation and reduction of area decrease in the proportion expected of such a rise in strength.

Aging Treatment Following Machining

A natural question at this stage is "What is the point of producing by a quench, temper, and aging treatment a combination of properties that could be achieved by quenching followed by a drawing temperature sufficiently low to develop these properties without the bother of subsequent aging?" The point is this: The steel can be quenched and tempered—or normalized and tempered if preferred—to develop a structure that can be readily machined, and the finish-machined part can then be aged to produce fairly high strength without any risk of the distortion that would normally follow conventional heat-treatment.

The aging treatment required to produce the properties shown in Table 2 comprised a forty-eight-hour treatment at 975 degrees F. It was, in fact, a simple nitriding or pseudo-nitriding cycle. If we ignore any necessity for producing a nitrided case, this cycle can be considerably shortened. Table 3 gives the results of various aging cycles with corresponding Rockwell hardness obtained in tests on 1-inch diameter bars oil-quenched from 1650 degrees F. and tempered at 1275 degrees F. for one hour to develop an initial base hardness of 29 C. It can be seen that fourteen hours is sufficient to reach the peak of 42 C, and if a goal of 40 C is satisfactory, an eight-hour treatment is enough.

Table 3. Progress of Precipitation Hardening in Nitralloy N

Aging Period at 975 Deg. F.	Rockwell C Hardness
Two hours	No Change (29)
Four hours	32
Six hours	35
Eight hours	40
Ten hours	41
Twelve hours	41
Fourteen hours	42
Sixteen hours	42

The highest practical hardness that can be developed by precipitation hardening is in the range of 42 to 44 Rockwell C. Higher aging temperatures permit the use of shorter times, but the ultimate hardness is not quite so high. Lower aging temperatures call for impractically long soaking periods. Increasing the initial hardness by lowering the drawing temperature does not help, as will be seen by reference to Table 4. It will be noted that for a drawing temperature of 1250 degrees F., the aging of the material in its softest condition—29 Rockwell C—produces a hardness of 41 C. Decreasing the drawing temperature produces no increase after precipitation hardening. Some improvement is developed when the tempering treatment is entirely omitted, but this defeats the purpose of having a material that is readily machinable in its prior condition.

Table 4. Effect of Varying Initial Drawing Temperature on Response to Precipitation Hardening

Drawing Temperature, Degrees F.	Hardness, Rockwell C	
	Before Aging	After Aging
No Draw	45	44
1000	40	41
1050	43	42
1100	33	40
1150	31	41
1200	30	40
1250	29	41

Test pieces were 1 inch in diameter, oil-quenched from 1640 degrees F. and drawn two hours at indicated temperature. Aging cycle comprised forty-eight hours at 975 degrees F.

The final hardness can be improved somewhat by raising the carbon content of the steel, but this, too, produces higher hardness in the softened condition, and hence not quite as good machinability. Consequently it appears that when

Table 5. Charpy Impact Values (Keyhole Notch) of Nitralloy N and Quenched and Tempered S A E 4340 Steel

Steel	Aging Temperature, Degrees F.	Charpy Impact Value, Ft.-Lb.*	Brinell Hardness
Nitralloy N	975	12	395
Nitralloy N	1000	18.5	384
Nitralloy N	1025	20.5	377
S A E 4340 Steel	....	23.5	385

*Average of three to five tests

quenching and tempering is the prior treatment, a hardness of 29 Rockwell C is the lowest that will permit easy machining. Subsequent precipitation hardening can develop a finished part with a working hardness above 40 Rockwell C, the maximum being about 44 Rockwell C.

Normalizing and tempering can be used as a prior treatment. This will give a hardness slightly lower than 29 Rockwell C, but every point lopped off is at the expense of a point of final hardness. This also is true of the annealing treatments previously described, which can give a Rockwell hardness as low as 18 C, but are detrimental to final hardness.

Impact Properties Dependent Upon Preliminary Treatments

Another objection to preliminary treatments other than quenching and tempering is that impact properties suffer appreciably. Table 5 shows the impact properties of Nitralloy N that has been given the best preliminary treatment available—namely oil quenching at 1650 degrees F., followed by tempering at 1200 degrees F. to produce a hardness of 263 Brinell. Comparisons are made with S A E 4340 steel.

When the standard aging treatment of 975 degrees F. is employed, an impact value of about 12 foot-pounds is obtained, which is rather inferior to that obtained with the slightly softer S A E 4340. When the hardness differential is wiped out by raising the aging temperature to 1000 degrees F., much improvement results for Nitralloy N, but it remains inferior to S A E 4340 even when aged at 1025 degrees F., which produces a hardness of 377 Brinell.

When resistance to impact is an important consideration, it is obviously advantageous to raise the aging temperature to 1000 to 1025 degrees F. If the preliminary treatment had consisted of normalizing or annealing, impact values would have been about 3 foot-pounds, which, in many instances, would be considered unsatisfactory for a heavy-duty gear steel.

Nitralloy N appears to be notch sensitive in respect to its endurance limit, as seen in Table 6. The unnotched endurance limit of Nitralloy N does not compare too unfavorably with S A E 4340 when allowance is made for the lower hardness and hence lower strength of the Nitralloy; notch sensitivity is high, however, being about 3 compared to 2.5 for S A E 4340. This comparison is extreme, since it pits Nitralloy N against a steel that has the reputation of being one of the best heavy-duty materials available, with excellent notch toughness at high strength levels.

Distortion Resulting from Heat-Treatment

A word about distortion. Nitralloy N reacts to quenching and tempering, the same as any heavily alloyed steel. Its distortion characteristics in this respect are not unique, and final machining should be completed only after this preliminary cycle. The distortion resulting from the precipitation hardening treatment is practically negligible.

When a nitrided case is produced, an allowance of about 0.001 inch per inch is made. This dimensional change, which incidentally is quite uniform, is nearly entirely due to the absorption of nitrogen by the surface layers. In the absence of nitrogen, the change in dimension is negligible. One manufacturer engaged in an investigation of this steel is aiming to hold the accuracy to 0.001 inch per inch, which will permit elimination of a final lapping or grinding operation.

Manufacturing Cycles for Nitralloy N Gears

With the foregoing data in mind, it is possible to outline suggested manufacturing cycles for Nitralloy N gears. The essence of such a cycle involves a preliminary oil quench and temper, after which the gear may be finish-machined from the forged blank and then subjected to the aging cycle. This produces the best combination

Table 6. Comparative Endurance Properties of Nitralloy N and SAE 4340 Steel

	Nitralloy N	SAE 4340 Steel
Unnotched Endurance Limit, Pounds per Square Inch	86,000	103,000
Notched Endurance Limit, Pounds per Square Inch..	28,000	40,000
Notch Sensitivity (ratio)..	3.07	2.58

Specimens tested in R. R. Moore machine to 10,000,000 cycles. Notch 45 degrees, 0.02 inch deep, 0.010 inch root radius.
Nitralloy N (0.20 per cent C) 1650 degrees F. oil-quenched; tempered at 1200 degrees F.; precipitation-hardened at 975 degrees F. to 38.5 Rockwell C (360 Brinell).
SAE 4340 steel oil-quenched and tempered to 378 Brinell.

of properties in the finished gear. If exceptional dimensional precision is desired, it may be advantageous only to rough-machine after the preliminary quench and temper, and then interpose a stress-relieving treatment at 1200 degrees F. before finish-machining and aging.

Sometimes a prior normalizing treatment at 1750 degrees F. is useful to promote homogeneity. This is true of most alloy steels. If notch toughness is not of great importance, the preliminary quench and temper may be replaced by a normalizing and drawing treatment. Static strength properties after aging are not appreciably impaired.

A third suggested treatment might involve complete annealing to produce a very soft structure for maximum machinability. Moderate strength would result by aging directly from this softened condition, and notched properties would, of course, be relatively low, but they would be satisfactory for many purposes.

Maximum machinability plus other desirable mechanical properties can be achieved by a combination of treatments when the added cost of such treatments is justified. This might involve full annealing, rough-machining, quenching, tempering, finish-machining, and aging, and would give all the advantages of a soft prior structure for best machinability, together with the excellent mechanical properties resulting from a prior quench and temper.

Although it has been deliberately ignored in this presentation, a nitriding cycle may be incorporated as the final aging treatment of this material, which will result in a surface hardness of about 950 Vickers, with a total case depth of about 0.02 inch. In such instance, the excellent wear resistance of the nitrided case is added to the heavy-duty properties of the core.

In a subsequent issue of MACHINERY, the properties and applications of ductile iron will be discussed.

* * *

Machinery's Annual Index Available to Subscribers Without Charge

Copies of the annual index to Volume 56 of MACHINERY (September, 1949 to August, 1950) are available to subscribers without charge. Those who wish to receive the index regularly can do so by asking to have their names included on the permanent list. Requests should be directed to MACHINERY, Circulation Department, 148 Lafayette St., New York 13, N. Y. The index enables those who maintain yearly files to readily find any information previously published in MACHINERY.

Industrial Applications of Recent Electrical Developments

Among recent noteworthy electrical developments by the General Electric Co. are several that have increased the versatility of certain machine tools, as well as other industrial equipment. For example, electronic and amplidyne-controlled drives have permitted one-man control of a large planer-miller. Used as a planer, the machine has fast, smooth reversal in a speed range of 80 to 120 R.P.M. Control is by a generator, whose excitation is supplied from a 3-kilowatt amplidyne generator, which, in turn, is electronically controlled from small rheostats on the operator's pendent push-button station. When used as a milling machine, the controls of table feed and speed are likewise easily adjusted from the control station. A 15-H.P. Thy-mo-trol drive is used for table motion over a 45 to 1 speed range.

The use of amplidyne generators with magnetic control has provided a flexible and accurate means of driving the clamping and feeding motions of a large transfer press. The direct-current motors driving these motions are accelerated smoothly under current limit to preselected speeds, and then decelerated in response to signals from limit switches mounted on the press. Minimum operation of contactors handling power to the motors is obtained, thus reducing maintenance and improving performance.

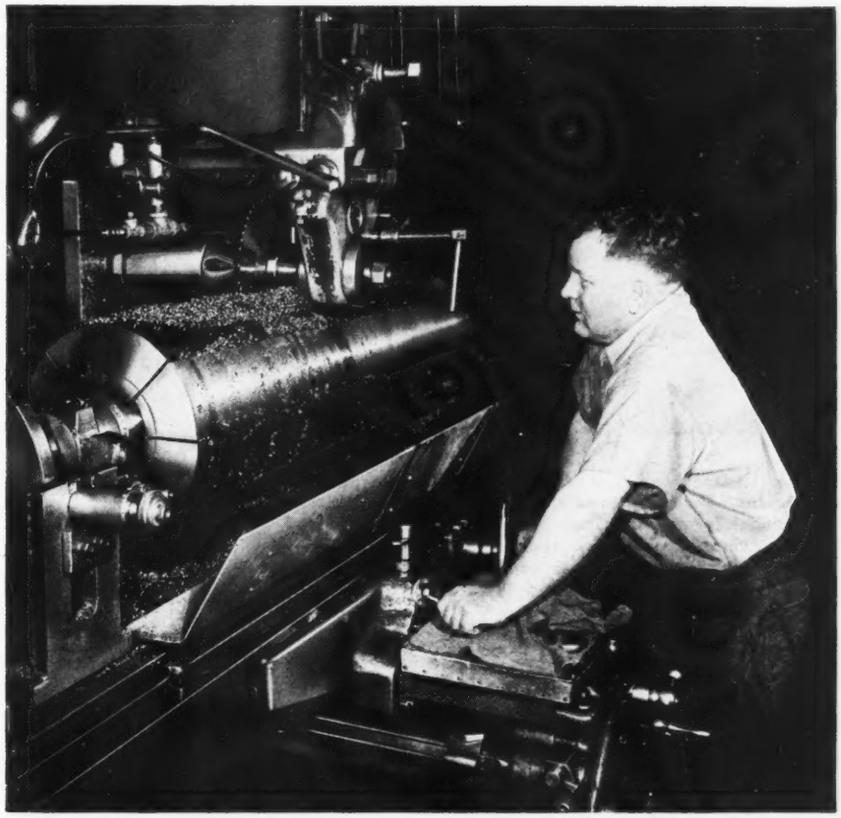
Electronic controls continue to provide an answer to drive and control problems on both existing and new designs of machines. Not only the metal fabricating but also the woodworking and wire industries have found increasing use for controls combining the amplidyne with other magnetic and electronic circuits.

The amplistat, technically known as a self-saturated magnetic amplifier, is used in conjunction with the amplidyne to maintain steel strip at a predetermined level in the pickling tanks of a new 66-inch high-speed pickling line, with results far superior to those obtained with the conventional dancer-roll rheostat. This device also demonstrated its ability to operate in conjunction with the amplidyne in a closed-cycle regulating system used to hold tension on the winding reel of the world's fastest cold-strip mill.

Electric drive equipment is being built by the company for three Sendzimer mills, the largest of which is driven by a 150-H.P. main motor and two 150-H.P. double-armature reel motors. One of the largest reversing cold-strip mills ever built is under construction for Belgium—a combination sheet and strip mill with a 3000-H.P. main drive and two 1000-H.P. reel drives.

Reducing Costs in Deep-Slotting Compressor Rotors

By
J. H. HUMMER
Superintendent
and
C. L. BOUGHTER
Tool Engineer
Hershey Machine & Foundry Co., Manheim, Pa.;
and
W. T. GLOOR
Motch & Merryweather Machinery Co., Cleveland Ohio



IN manufacturing or processing plants, requirements for large or small volumes of compressed air can be supplied by the use of rotary type compressors, such as those furnished by the Fuller Co., Catasauqua, Pa. Single-stage units provide considerable savings in installation and distribution costs where pressures of 50 pounds gage or less are required, while two-stage compressors supply average needs for pressures from 51 to 125 pounds gage. Rotary, multi-vane type vacuum pumps of similar mechanical design are also supplied by the Fuller Co. in single- and two-stage units developing vacuums up to 29.3 and 29.9 inches (referred to 30 inches barometer), respectively.

The steel rotor for such units is accurately machined with an integral shaft. The eccentric mounting of the rotor within the cylinder, as shown in Fig. 1, forms a free space, crescent-shaped in cross-section, divided into compartments by the blades. Fuller equipment is manufactured at the Hershey Machine & Foundry Co., Manheim, Pa., a subsidiary of the Fuller Co. This company is continually striving to lower production costs without sacrificing the accuracy required in such equipment.

One of the machining operations that took considerable time was the slotting of the rotors, as seen in the heading illustration. In the last four years, the time required for this difficult slotting operation has been reduced to less than 20 per cent of the former time. The operation consists of milling eight equally spaced slots in the compressor rotor by means of the conventional set-up shown. The rotors are forged from S A E 1030 or 1035 steel and stress-relieved at a temperature of 1100 degrees F. The hardness of the rotors is approximately 180 Brinell.

When a study of the slotting operation was made in 1942, with a view to reducing the time, the advice of leading milling machine companies was obtained. It was then suggested that a staggered-tooth milling cutter be used, with a depth of cut for each pass of the cutter of 1/2 to 5/8 inch. During the war years, some progress was made in reducing the slotting time for a typical rotor. On this typical size rotor, which weighs about 2600 pounds, the eight equally

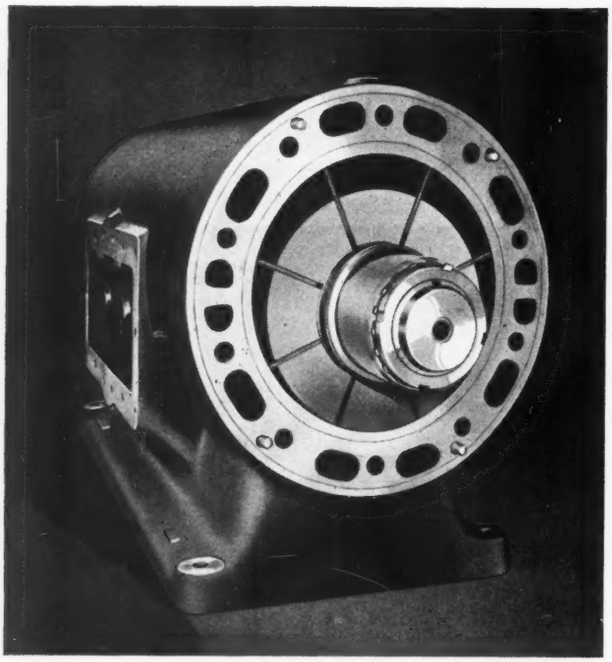


Fig. 1. Open-end view of rotary, multi-vane type compressor. Eccentric mounting of the rotor within the cylinder forms a crescent-shaped space that is divided into compartments by the blades. Eight equally spaced slots are milled to hold the blades, as shown in the heading illustration

spaced slots are each 0.253 inch wide, 3 3/4 inches deep, and 51 1/4 inches long. A tolerance of + 0.001 inch — 0.000 inch is maintained on the slot widths. In the conventional milling set-up, each slot is roughed out in two passes and finished to size in the third pass of the cutter.

In 1946, a definite cost reduction program was put into effect and much development work was carried out by the company. During the spring of 1948, it was found that a cast-alloy tipped finishing cutter of the company's own manufacture gave superior performance to the cutters formerly used.

The accompanying table shows the progress made in reducing the time required for machining this particular size rotor. The three operation numbers shown in the second column, for each year, are: No. 1, first roughing cut; No. 2, second roughing cut; and No. 3, finishing cut. All of the slotting cutters are high-speed steel, except the three marked with an asterisk in the "Tooth Type" column. The teeth of these three cutters, which were made by the Hershey Machine & Foundry Co., are tipped with cast alloy.

One of the problems encountered in increasing the feeds for roughing out the slots was the high rate of breakage of the slotting cutters. In the fall of 1948, the Motch & Merryweather Ma-

Progressive Decrease in Time Required for Slotting Compressor Rotors During Last Four Years

Year	Operation No.	Cutter Specifications				Cut Depth, Inches	Total Depth of Slot, Inches	Feed, Inches per Minute	Speed, Feet per Minute	Reduction in Operation Time, Per Cent
		Diam., Inches	Thickness, Inch	Number of Teeth	Tooth Type					
1945	1	9	3/16	52	Stagger	1 1/2	1 1/2	1 5/8	100	
	2	11 1/2	3/16	52	Stagger	2 1/8	3 5/8	1 1/4 Max.	100	...
	3	11 1/2	0.253	52	Stagger	3 3/4	3 3/4	3/4 Max.	100	
1947	1	9	3/16	26	Stagger	1 1/2	1 1/2	2 5/8	100	
	2	11 1/2	3/16	26	Stagger	2 1/8	3 5/8	1 5/8	100	34.2
	3	11 1/2	0.253	26	Stagger	3 3/4	3 3/4	1	100	
1948 Spring	1	6	3/16	42	Sub-land	1 1/2	1 1/2	4 1/4	100	
	2	9 1/2	3/16	18	Stagger	1 5/8	3 1/8	2 5/8	100	57.0
	3	11 1/2	0.253	26	Stagger*	3 3/4	3 3/4	2	225	
1948 Fall	1	7	13/64	46	"Triple-Chip"	1 1/2	1 1/2	7 1/4	100	
	2	10	3/16	56	"Triple-Chip"	1 1/2	3	7 1/4	100	71.0
	3	11 1/2	0.253	26	Stagger*	3 3/4	3 3/4	2	225	
1949	1	8	13/64	46	"Triple-Chip"	2	2	9 1/4	100	
	2	10	3/16	56	"Triple-Chip"	1 1/2	3 1/2	7 1/4	100	79.0
	3	11 1/2	0.253	26	Stagger*	3 3/4	3 3/4	2	225	
1950	1	8	13/64	46	"Triple-Chip"	2 1/8	2 1/8	7 1/4	80	
	2	11 1/2	3/16	56	"Triple-Chip"	1 1/2	3 5/8	7 1/4	80	82.4
	3	11 1/2	0.253	32	Even-Height Generated	3 3/4	3 3/4	5 5/8	100	

*Cast-alloy tipped cutters made by Hershey Machine & Foundry Co.

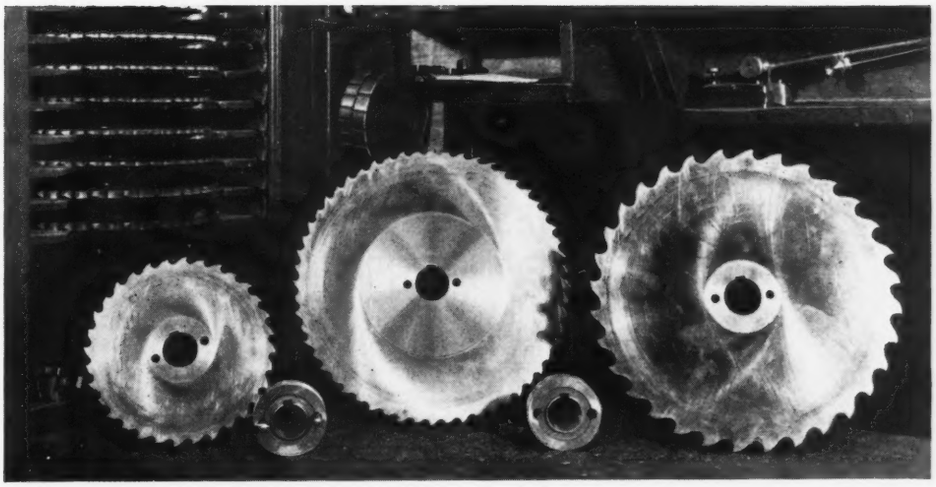


Fig. 2. Set of three high-speed steel milling cutters used for slotting large-size rotor. The cutters, from left to right, are used for first-pass roughing, second-pass roughing, and third-pass finishing

chinery Co. was asked to supply "Triple-Chip" cutters for this roughing operation. In this type cutter, each two consecutive teeth are ground alternately high and low. The first, or higher, tooth in each set is the roughing tooth. The corners of these teeth are beveled at a 45-degree angle, so that only about one-third of the cutting edge is applied to the work in the center of the cut. The second, or finishing, tooth in each set is full width, but slightly lower than the preceding roughing tooth, and removes the two corners from the cut. Thus the chip is broken and the load is distributed evenly among the teeth.

Preliminary tests with such cutters indicated that feeds up to 11 3/4 inches per minute could be used in a conventional milling operation while still maintaining the slot width within the close tolerance necessary. In fact, during one test, the feed was accidentally set at 24 inches per minute and the cutter milled a slot 6 inches long before it was noticed that the fixture had moved on the table and the machine stalled. The cutter, though badly dulled, was not otherwise damaged and continued to mill the remaining slots at the conditions indicated in the table for 1948 (fall).

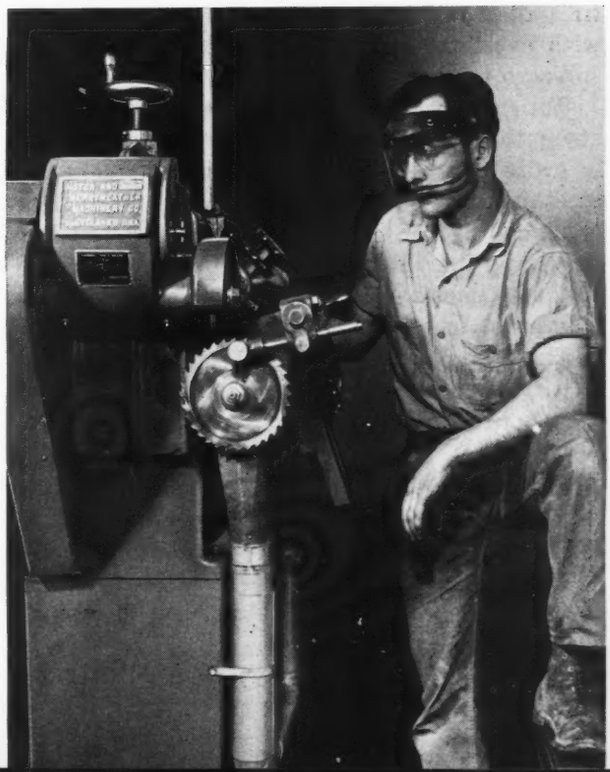
All cutters now used are driven by a two-pin arrangement, which has substantially aided in overcoming breakage. Beginning with the fall of 1948, cutter breakage was practically eliminated, in spite of the fact that feed rates were markedly increased, as indicated.

Fig. 2 shows the three cutters and driving adapters now used in slotting the large-size rotor. It has been found, in using these Triple-Chip cutters, that at least eight slots can be cut at present feeds and speeds without materially dulling the teeth. Sharpening of the cutters is accomplished in the tool-room on an automatic sharpening machine (Fig. 3) which develops the cam-generated tooth shape desired. The cutter is sharpened with a rake angle of 15 to 20 degrees and a top clearance of 12 to 15 degrees.

Every precaution is taken to insure the best possible cutting conditions, as the value of a rotor, up to the point of slotting, is very high. In order to be sure that all teeth are clear of chips before re-entry into the cut, the teeth are automatically cleaned by meshing with a wire brush as they leave the cut. The cutting oil used has a quart of extreme-pressure oil added to each five gallons of cutting oil in order to minimize any tendency toward galling.

While further improvements in the slotting operation may be made in the future, it is felt that the major cost reduction in the slotting of rotors has been accomplished. With the present rapid production methods, the slot size is held to the specified tolerance. The slots produced are straight, and economical tool life is obtained.

Fig. 3. Automatic sharpening machine employed to sharpen the milling cutters seen in Fig. 2. The cutters are sharpened with a rake angle of from 15 to 20 degrees and a top clearance of 12 to 15 degrees



Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Bearing Surface Material Applied by Spraying

Metallizing Engineering Co., Inc., Long Island City, N. Y., has developed a self-bonding metallizing material called "Sprabond" wire, which provides long wearing properties to bearing surfaces. Application of this material to bearing surfaces requires three operations—cleaning or under-cutting of the part; application of the wire by spraying; and finish-grinding of the sprayed surface.

In addition to its use as a finish coating, the material can be employed as a foundation for bonding on a coating of a different metal. Base metals over which "Sprabond" can be applied include nickel and nickel alloys, aluminum, magnesium, and various ferrous alloys. 1

New Plate Steel is Strong, Tough, and Weldable

A new group of alloy steels, to be known as "T-steels," has been announced by the Carnegie-Illinois Steel Corporation, New York City. The first of these steels—"Carilloy" T1—is a multiple-alloy plate steel that combines high strength with excellent ductility and toughness, even at sub-zero temperatures.

With almost double the strength of high-strength, low-alloy steels and almost triple that of ordinary welding grade structural steels, this steel may effect considerable savings in applications calling for heavy steel members 1/2 inch thick and up. It is designed to be at least two to three times as resistant to atmospheric corrosion as plain carbon steels.

The new plate steel is furnished heat-treated to a minimum yield strength of 100,000 pounds per square inch. It maintains adequate toughness, even at this high level of strength, and is suitable for application where high strength and good weldability are required. Welding does not adversely affect the properties of this steel, which requires no special heat-treatments either before or after welding or gas-cutting operations beyond those normally used with ordinary structural steels. If low-hydrogen type electrodes are used, it is not susceptible to under-bead cracking. Electrodes that will develop the full strength of the metal are available, and should be used if 100 per cent joint efficiency is needed.

No special equipment or procedures are required for fabrication, and bending or forming can be accomplished cold if sufficient power is available to overcome the high yield strength. If hot-forming is necessary, it must be followed by liquid quenching and tempering. 2

Liquid Soldering Flux Eliminates Preliminary Cleaning

"Divco No. 229" is a new liquid soldering flux being manufactured by the Division Lead Co., Chicago, Ill. This liquid flux eliminates almost all of the pre-soldering cleaning and burnishing of metal parts. The container is designed so that a light squeeze directs a fine stream of flux on the parts to be soldered. It is claimed that this flux speeds up soldering operations on copper, brass, bronze, nickel, cadmium, zinc, tin, galvanized iron, steel, and Monel metal.....3

Copper-Molybdenum Alloy Roll Used to Produce High-Speed Steel Billets

A copper-molybdenum cast alloy steel originally developed by the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa., for steel castings is now being applied to the production of steel rolls for the dry rolling of high-speed tool steel. This new development makes it practical to reduce high-speed steel from ingot to billet form by rolling instead of by hammering and forging. Since reduction from ingots to billets can be accomplished about five times faster in this way, the roll will help steel mills maintain production of high-speed tool steel to meet the demand of machine tool makers.

The "Birdsboro 30" alloy-steel roll, as it is known, does not require water coolant due to its

To obtain additional information about materials described here, use Inquiry Card on page 229.

heat dissipating qualities. Cracking of the roll and the steel is thus eliminated. Since the cast-steel structure will not take a permanent bend, the roll can be used almost continuously. These alloy-steel rolls range from 10 to 32 inches in diameter and from 30 to 66 inches in length, and will roll ingots up to 12 inches square. 4

Degreasing Fluid for Metals that is Usable at Room Temperature

Grease, oil, wax, finger marks, and moisture can be readily removed from metals and plastics with a new metal degreaser manufactured by the Barco Chemical Products Co., Chicago, Ill. Some of the more important uses of this fluid, identified as "Q200," include the cleaning of jigs and fixtures and the removal of foreign particles from parts to be inspected. No heat is required in the application of this degreaser, and it can be applied by dipping, brushing, or wiping....5

Fast Acting Casehardening Compound for Steel and Cast Iron

A fast acting casehardening compound, known as "Hard'N'Tuff," which is applicable to steel and cast iron has been developed by Doughty Laboratories, New York City. With this compound, it is possible to produce a nitriding and carburizing effect on properly heated steel surfaces, increasing the hardness and wear resistance of the metal to which the material is applied. High-speed steel drills and cutting edges and wearing surfaces on dies, molds, hammers, cams, etc., are said to be given increased service life by the use of this compound, and reduced maintenance costs result. 6

Easily Removed Metal Buffing and Coloring Composition

Buffed and polished metal products require to be cleaned in order to remove the buffing and coloring compositions from recesses and similar irregularities in the part. The Hanson-Van Winkle-Munning Co., Matawan, N. J., has developed for this purpose a water-dispersible buffing and coloring composition, designated No. 4-S-10, which is easy to remove in aqueous solutions using a mild alkaline cleaner, with or without electric current. It is applicable to work having deep filigrees in which the buffing compound becomes packed in hard masses. All nonferrous metals except nickel can be buffed with this material. 7

Aluminum Paint for Temperatures up to 1500 Degrees F.

"Heat-Rem" is a new high heat-resistant aluminum paint, which has been improved by the addition of silicone, according to a recent announcement by the manufacturer, Speco, Inc., Cleveland, Ohio. Applied to exterior and interior metal surfaces at temperatures of 1000 to 1500 degrees F., it fuses with the metal surface, forming a bright elastic finish, resistant to moisture, corrosion, mild acids, alkalies, and industrial fumes. It is said to set in four hours. The new paint is suitable for use on heat lines, radiators, condensers, compressors, and ovens. 8

Anti-Rust Protection for Machined Steel Surfaces

Nox-Rust Chemical Corporation, Chicago, Ill., has announced a new rust control compound known as Nox-Rust 310-AC. Accelerated tests show that this compound will protect machined steel surfaces for a period of 150 hours when exposed to 100 per cent relative humidity at 100 degrees F. Under normal conditions, parts can be stored safely in protected areas for periods of two to three months when not packaged, and for a much longer time when wrapped. The new anti-rust compound is applied by brushing or spraying, but the cold dip method is recommended for maximum effectiveness, especially where fingerprints are to be removed. 9

Liquid Phenolic Tool Plastic with Minimum Shrinkage

Rezolin, Inc., Los Angeles, Calif., has developed a new liquid phenolic casting resin called "8000 Tool Plastic" which is being manufactured by Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y. This plastic is said to eliminate the shrinkage encountered in previous materials of this type and to permit economical production of tools and models without elaborate shop equipment or highly skilled personnel.

Dimensional stability of the cast tools or models is said to be high. The manufacturer states that savings up to 50 per cent in time and cost can be obtained in producing checking fixtures, large hydraulic and stretch press dies, jig bases, master models, trimming and routing fixtures, spinning chucks, etc., with the new material.

This plastic is always used with an accelerator paste, two types of which are available—"8000" paste and "Quick-Set" paste. Twenty-five parts of paste are used with 100 parts of the resin..10

To obtain additional information about materials described here, use Inquiry Card on page 229.

Manpower Shortage Discussed at Meeting of Tool and Die Makers

AT the fifth annual convention of the National Tool and Die Manufacturers Association, held at the Hotel Statler in Cleveland, October 29 through November 1, sober advice on the manpower shortage now confronting contract tool and die shop owners was given by Colonel Joel D. Griffing, chief of the Manpower Division, Selective Service System. Colonel Griffing suggested that the current draft status of every skilled employe between the ages of nineteen and thirty-five should be reviewed immediately. In cases where deferments are considered essential, formal notice should be filed promptly with the local Selective Service office, without waiting until the employe receives his 1-A card. Warning that the Army's acceptance rate is rising, Colonel Griffing said, "Military rejections today will not stand in an emergency."

Herbert F. Jahn, new president of the National Tool and Die Manufacturers Association

On the optimistic side, many tool and die shop owners still hold high hopes that Selective Service will issue a list of essential occupations, in which case they feel that tool and die makers would receive recognition for the vital role they must play in any rearmament program.

Another important address was made by John H. Williams, chief of the Industrial Equipment Division, Office of Production Planning, Munition Board. He pointed out that tool and die makers can apply, on a lease basis in connection with urgent defense contracts, for machine tools held in reserve by the Armed Forces. There are approximately 60,000 machine tools available, many of which have been recently restored to 100 per cent operating efficiency by complete dismantling and the replacement of worn and missing parts.

In a speech by George A. Moore, United States Department of Commerce Regional Director, members of the Association were told that they don't have to cater to Washington "five per centers" to obtain business from government agencies. Local Commerce Department offices can provide small business with practically all the information required to bid on defense contracts. The idea is to keep the businessmen at home on the job and to allow Government to enjoy the lower prices attending competition. Die shop owners should use these facilities.

Herbert F. Jahn, president of the B. Jahn Mfg. Co. of New Britain, Conn., was elected president of the Association, succeeding Centre W. Holmberg, president of August W. Holmberg & Co., Inc., of New York. Other officers elected were: First vice-president, R. H. Cope, comptroller of Bunell Machine & Tool Co., Cleveland, Ohio; second vice-president, Alfred Reinke, president of Gus Reinke Machinery & Tool Co., Hillside, N. J.; treasurer, Herbert Harig, vice-president and treasurer of Harig Mfg. Corporation, Chicago, Ill.; and secretary, Herbert C. Murrer, Murrer Tool Co., Cincinnati.

Motion Picture on Fair Day's Work Time Study

About 2800 feet of motion picture film showing twenty-four industrial, clerical, and laboratory operations, each performed at five different speeds, have been produced by the Research Division of the New York University College of Engineering in a program sponsored by the Society for the Advancement of Management. These films were prepared to determine what a fair day's work is. They should be useful to industrial firms in helping to achieve more uniform time standards among departments. A manual of instructions has been prepared to accompany the films. No rental films are available, and only complete sets will be sold. Those interested can obtain further information from Professor D. B. Porter, New York University College of Engineering, New York 53, N. Y.

Checking Angle of Taper Plug Gage with Aid of V-Block

By CHRIS FETTE

IN the accompanying illustration is shown a taper plug gage supported by a V-block, which, in turn, rests upon a sine bar. By tilting the sine bar to the proper angle A with gage-blocks, the top edge cd of the plug gage can be located in a horizontal position as checked by a height gage and indicator. After finding the value of angle A by computation, the value of one-half the included angle of taper B can be computed.

Placing a taper gage of this kind in a V-block to check the angle of taper has certain advantages. The gage is prevented from rolling, and its center line is automatically located at right angles to the hinge of the angle or sine plate, assuming, of course, that the axis of the V-block is placed at right angles to the hinge. The gage is also held securely in position for checking such conditions as surface irregularities, out-of-roundness, etc.

The diagram shows a vertical plane through the center of the taper plug gage and the bottom of the vee. Note that sides cd and $c'd'$ of the gage have been extended to intersect at point y. It can be shown that, regardless of the angle of taper or the angle of the vee, the end point of the taper will always be located somewhere along the bottom of the vee.

An imaginary sphere of radius m is shown tangent to the edges cd and $c'd'$ of the plug gage at points c and c', respectively. The dotted part of the diagram at the left represents a cross-section of one-half the V-block taken through xo, and shows the sphere tangent to one side of the vee at point e. In the main part of the diagram, fg shows the line contact of the gage with the side of the V-block. It will be noted that f is at the same height as e above the bottom of the vee.

In the diagram, C is one-half the angle of the vee.

Then in triangle xoe,

$$xo = xe \text{ cosec } C = m \text{ cosec } C \qquad (1)$$

In triangle xop,

$$xp \text{ (of parallelogram } cspx) = xo \text{ cosec } A = m \text{ cosec } C \text{ cosec } A \qquad (2)$$

In triangle spy,

$$sy = sp \cot A = m \cot A \qquad (3)$$

In triangle xcy,

$$cy = xc \cot B = m \cot B \qquad (4)$$

But

$$cy = xp + sy \qquad (4a)$$

Then

$$m \cot B = m \text{ cosec } C \text{ cosec } A + m \cot A \qquad (5)$$

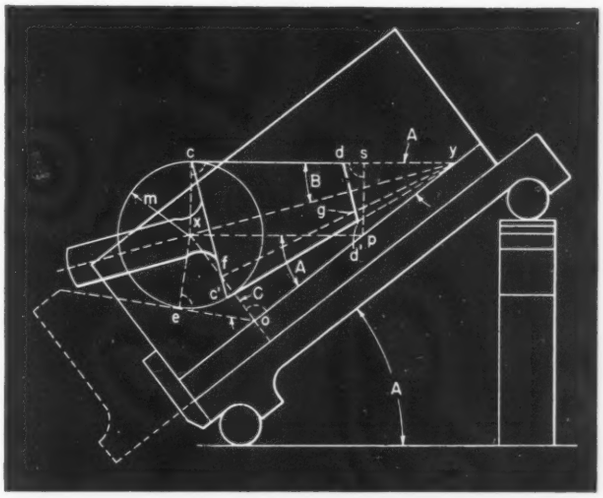
or

$$\text{Cot } B = \text{cosec } C \text{ cosec } A + \cot A \qquad (5a)$$

For a 90-degree V-block, $C = 45$ degrees and

$$\text{Cot } B = 1.4142 \text{ cosec } A + \cot A \qquad (5b)$$

Example—A taper plug gage is placed in a 90-degree V-block for checking the half-angle of taper B. To bring the top edge of the plug parallel with the surface plate, gage-blocks totalling 3.1103 inches in height are used to support one end of the 5-inch sine plate. What is the half-angle of the taper of the gage?



The half-angle of taper (B) is readily checked by placing a taper plug gage in a V-block, elevating it until the top edge (cd) is parallel to the surface plate, and then finding the angle of elevation (A)

Solution—

$$\text{Sin } A = \frac{3.1103}{5} = 0.62206$$

$A = 38$ degrees 28 minutes

$$\text{Cot } B = 1.4142 \text{ cosec } 38 \text{ deg. } 28 \text{ min.} + \cot 38 \text{ deg. } 28 \text{ min.} \qquad (5b)$$

$$\text{Cot } B = 1.4142 \times 1.6077 + 1.2587$$

$$\text{Cot } B = 3.5323$$

$B = 15$ degrees 48 minutes 25 seconds

New General Electric Aircraft Gas-Turbine Laboratory

A NEW aircraft gas-turbine laboratory where vital parts of secret jet engines are operated under test conditions never before attained was recently dedicated by the General Electric Co. at Lynn, Mass., in honor of the late Dr. Sanford A. Moss. Dr. Moss created the forerunner of the modern turbo-jet engine forty-seven years ago, and later won aviation fame as the father of the turbo-supercharger, which enables aircraft to fly in the thin air of high altitudes.

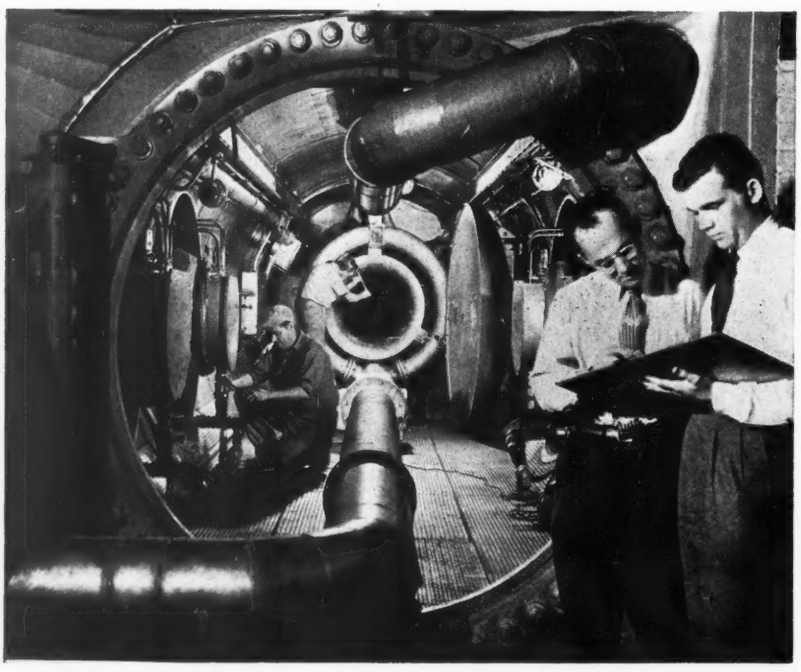
The dedication ceremonies, attended by Air Force and Naval officers, company officials, civic leaders, and the press, provided the first public glimpse of the testing facilities, where altitudes of 70,000 feet and temperatures of 100 degrees F. below zero can be simulated.

The heart of the laboratory is the 40-foot long, insulated and pressurized steel cylinder shown in the accompanying illustration. Here experimental compressors for future engines are tested and operated under instrumentation. Nearly 700 measuring instruments, which transmit information to the soundproofed control room, record performance of the compressor in operation.

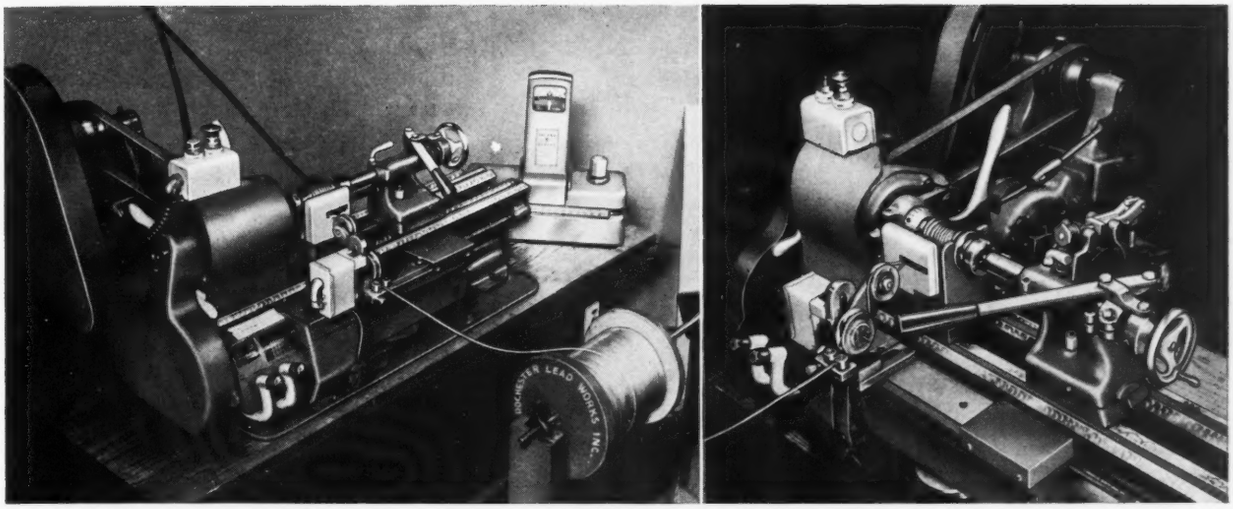
The laboratory also includes a combustion test stand, a small stand for testing scale-model compressors, and a blade test stand which also serves as a source of air for combustion testing. Turbine testing is performed with other facilities in the test and production center.

Power to drive a compressor of the J-47 engine—the engine now being produced—is derived from a 35,000-H.P. steam turbine power plant, which can drive compressors capable of supplying air flows of 320 pounds per second. Such a compressor could completely change the air in a six-room house in two seconds. To provide superheated steam at the rate of 255,000 pounds per hour, which is needed to drive the steam turbine, a large boiler has been added to the River Works power house. More than 14,000,000 cubic feet of air an hour can be cooled to 100 degrees F. below zero through an ingenious cooling cycle, which utilizes water drawn from the adjacent Saugus River and four sets of refrigeration compressors and turbines. When in full operation, the laboratory requires 4,800,000 gallons of water per hour.

The compressor driving power plant, which is connected with the compressor by a speed increasing gear at the rear of the cylindrical test cell, is operated during tests from the master control room, where research readings are taken. The air-conditioned control room is a maze of gages, meters, and instruments. The 700 readings taken while a compressor is under test cover temperatures, air flows, air pressures, torque, blade strain, and vibration. All air flows and temperatures are measured in triplicate. For one important measurement, an entirely new instru-



Inside this insulated and reinforced steel cylinder in the General Electric Co.'s new aircraft gas-turbine laboratory at Lynn, Mass., experimental compressors for jet engines are operated under test conditions never before attained. For example, altitudes of 70,000 feet and temperatures of 100 degrees F. below zero can be simulated



Views of South Bend lathe with electronically controlled equipment for winding wire solder into 1-pound rolls

ment, known as a "Clearanceometer" was designed. This measures the actual and instantaneous clearance between the compressor casing and the rotor-blade tips while the unit is operating at thousands of revolutions per minute.

The production of jet engines on an assembly line basis to meet expanding Air Force needs was also demonstrated to the visitors. The inspection covered the entire range of manufacturing operations—from the processing of raw materials into finished parts at the nearby Everett plant to the loading of completed engines into specially built cylinders for shipment to the Air Force. Also shown were the manufacture and assembly of turbo-superchargers.

Another new laboratory inspected by the group of visitors was the measurements laboratory, which is staffed by engineering specialists in magnetism, electricity, chemistry, metallurgy, sound, heat, light, and color, and contains complete facilities for applied research, product development and design in the field of measurements. Unlimited mechanical and electrical services have been made available to all work areas through a complete system of pipes and bus ducts suspended from the corridor ceilings.

To keep a constant check on the calibration of testing equipment, a set of primary standards, equivalent to those at the Bureau of Standards in Washington, D. C., is maintained at the laboratory. The applicable standards include time, temperature, resistance, and voltage. These primary standards form the reference from which the calibration of intermediate standards are derived. The intermediate and working standards, in turn, are used to calibrate the actual resistors, shunts, potentiometers, volt-multipliers, voltmeters, and other instruments used for the final calibration of measuring apparatus.

Lathe Adapted for Winding Solder into Rolls of Uniform Weight

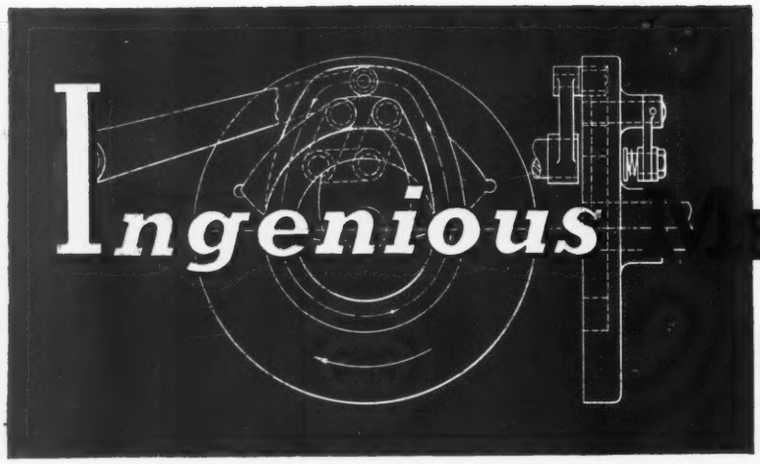
Recognizing the need for a faster and more accurate means of winding wire solder into 1-pound rolls, the Rochester Lead Works, Rochester, N. Y., developed the ingenious machine shown in the accompanying illustration. A small South Bend precision bench lathe was used as the foundation of the machine. Then a special electronically controlled measuring device, designed to work in conjunction with an electric braking mechanism, was mounted on the lathe. This combination of units resulted in a winding machine capable of producing 216 one-pound rolls of solder, with or without a spool, per hour.

The size of each roll of solder is automatically controlled so that it will not weigh less than 1 pound nor over 1 pound 1/8 ounce. The best production obtained with equipment previously used was 250 rolls of solder per day with a much wider weight tolerance. Since these rolls had to be on the heavy side of the nominal 1-pound weight, the wider tolerance necessary with the older equipment resulted in the use of more solder per roll.

The South Bend lathe was used for the foundation of this solder winding machine largely because of its wide range of power longitudinal feeds. The use of the standard quick-change gear-box feeds, added to the ease with which special ratio intermediate gears could be obtained, drastically reduced the expense involved in obtaining proper feeds for the various diameters of wire solders.

* * *

Steel, the lowest priced metal, is also cheaper, pound for pound, than many kinds of wood.



Ingenious Mechanisms

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

Automatic Feed Mechanism with Quick Return Motion

By B. SPECTOR

Short metal tubes of various lengths and diameters are polished and buffed on centerless grinding machines. In handling this work on the standard type of centerless grinder, the operator inserts an unpolished tube with his right hand, and as soon as the automatic feed is in action, pushes a handle to actuate the feed-belt pusher. After the tube is polished, the operator inserts a wooden stick in it with his left hand to remove it from the machine. In order to provide for automatically feeding the work to the machine and ejecting it, thus eliminating the need for constant attention by the operator, the regulating wheel was replaced by an endless belt and the automatic feed mechanism shown in the illustration was developed. With this arrangement, the operator merely needs to keep the hopper loaded.

The hopper A, section X–X, is designed for tubes W, 1 1/2 and 1 1/4 inches in diameter, which lie parallel to each other when the hopper is loaded. A hinged bottom B is swung on its pivot by an eccentric D, which receives its rotary motion from a constantly rotating shaft E. This shaft is supported in bearings b_1 and b_2 (see plan view), which are adjustable in the direction indicated by line L_2–L_3 (section X–X), so that the amount of movement of hopper bottom B can be regulated. A constant-speed source of power drives shaft E by means of pulley P_2. Pulley P_3, in turn, is driven from shaft E, and this drives pulley P_4 to rotate feed-screw F_s.

Referring to the plan view and to the front elevation, A_1 is that part of the hopper which is fastened to the machine and has a rail R_1; A_2 is an adjustable section of the hopper, designed to accommodate any length y of tube W, and has rails R_2 and R_3 on which the work rolls into position W_n.

The adjustable wall A_2 has an extension N provided with two stop-buttons P which limit the return stroke of slide S (section Y–Y) as will be described. The slide mechanism, which has a pusher F, also includes a half-nut Q into which are pressed two pins R. These pins fit loosely in holes through slide S and are fastened to a spring support T. A spring U keeps half-nut Q and slide S in contact, or closed, in which position Q is engaged with feed-screw F_s. The right-hand buttress thread of the feed-screw feeds slide S in the direction of arrow Y, on fixed rods V, when the half-nut and feed-screw are engaged. When they are disengaged, as shown in section Y–Y, where slide S and half-nut Q are separated, slide S returns to the starting position by means of the pull provided by counterweight CW, which is essentially a dashpot, since its outer casing is partly filled with oil.

The disengagement of the half-nut Q and the feed-screw for the return stroke is accomplished by means of pin p in feed-screw F_s, which enters a space Z milled in the half-nut. When members Q and F_s are engaged, pin p is at line C_L, shown in dot-and-dash lines in section Y–Y, and a clearance of 0.050 inch exists between the pin and the front of the half-nut, as shown in the enlarged detail, section Z–Z. The lead of the feed-screw is 1/3 inch per revolution; hence, as the feed-screw turns through 270 degrees, or three-quarters of a revolution, the nut will advance 3/4 $(1/3 - 0.05) = 0.212$ inch.

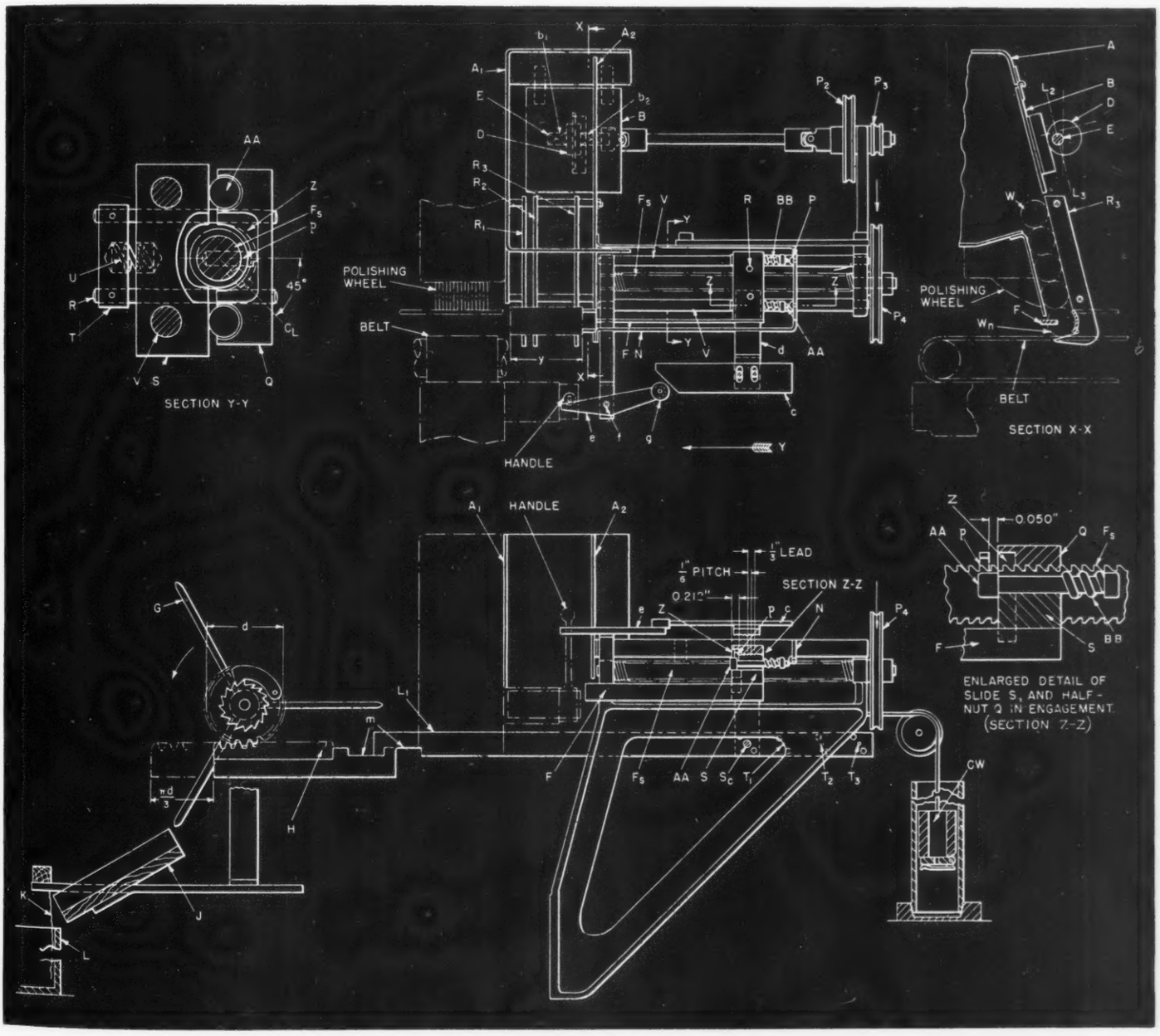
At this point, the pin will have entered the half-nut a distance of 0.212 inch, as shown at section Z–Z in the front elevation, and will have raised it against spring U to separate it from slide S and the feed-screw. The distance the half-nut is raised is sufficient to clear the heads of bolts AA from slide S so that two springs BB can pull them along the top of the slide, as will be

understood by reference to sections *Y–Y* and *Z–Z*. The two parts remain disengaged while the bolt heads rest on top of slide *S*, instead of being engaged with it, as shown in the enlarged detail *Z–Z*. The counterweight *CW* then pulls the slide (and the half-nut) in the return-stroke direction.

Since the amount of weight *CW* is adjusted to overcome friction plus the compression of springs *BB* for the length of the heads of bolts *AA*, when the ends of the bolts strike stops *P*, springs *BB* are compressed and the bolts back up so that their heads drop down into engagement again with slide *S*. Spring *U* then exerts pressure against slide *S*, so that the half-nut and feed-screw engage again, thereby repeating the reciprocating motion. The working area between these elements of the feed mechanism is small, but it is sufficient for the light work it is required to do.

This reciprocating movement of any predetermined length *y* is repeated automatically as long as the feed-screw rotates. Incidentally, this mechanism also acts as an automatic timer, the time duration of the cycles being proportional to the set length *y*.

As shown in the plan view, the hopper is set up for a certain length *y*. If a different length of tube is to be polished with the same equipment, the adjustable section A_2 is reset to the



Feed mechanism used with centerless grinder for automatically loading and unloading tubes during a polishing operation

new length y and a screw S_c (front elevation) is reset to any of the tapped holes T_1, T_2, etc. The two holes on each side of S_c or T_1, etc., are for dowel-pins which are not removed.

A ratchet wheel, mounted on a pinion, carries three metal rods G that pick up polished tubes and carry them to a chute J, from which they slide into a receptacle L after passing a cloth apron K. A connecting arm L_1 on slide S engages a rack H during the forward stroke, after an idle period provided by open sections m. This idle movement is used to obtain a fast return stroke while the counterweight CW falls freely before reaching the oil cushion.

On the forward stroke, arm L_1 moves the rack a distance $\frac{\pi d}{3}$ (since the pitch diameter of the pinion is d) to position it for turning the ratchet wheel 120 degrees on the return stroke. During this forward movement, the ratchet wheel and rods or arms G are stationary, due to the action of a pawl that pivots on the pinion and slides over the teeth of the ratchet wheel. This permits the automatic pick-up of a polished tube on one of the stationary arms.

The first part of the return stroke is fast, as previously mentioned, and amounts to the idle motion of the rack plus 55 degrees of the rotation of arms G, when the pawl engages the teeth of the ratchet; the remaining 65 degrees is slowed up by the cushioning effect of the dashpot.

A cam c is fastened to a flat spring d, see plan view; the latter, in turn, is fastened to slide S. A rocker arm e swivels on a fixed pivot f. It has a roller g at one end and pushes the machine handle at the other end. When the slide moves in the direction of arrow Y, cam c exerts pressure on the handle to apply pressure to the belt. The amount of pressure is adjustable by means of two elongated slots in cam c.

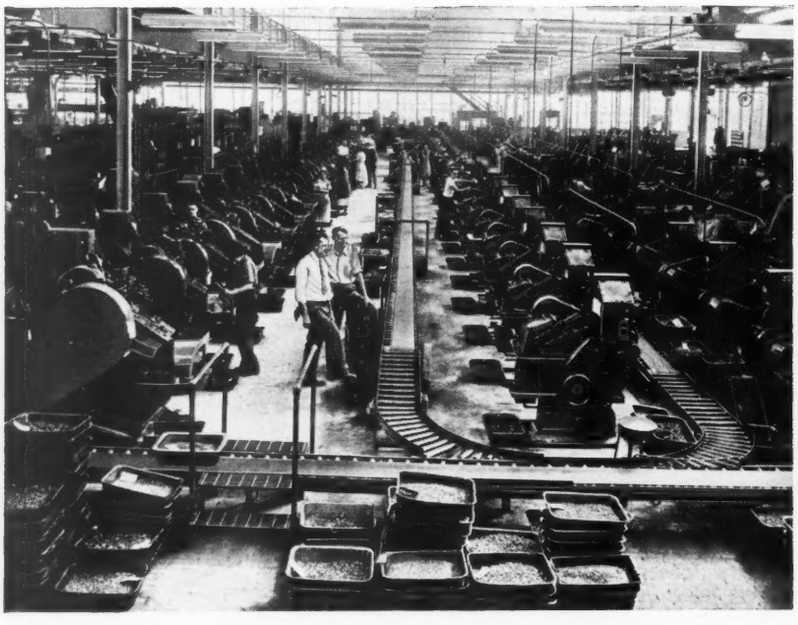
* * *

National Mobilization Meeting of Engineering Companies

H. L. Tigges, chairman of the Machine Tool Industry Mobilization Group and president of the American Society of Tool Engineers, will address the National Association of Engineering Companies at their National Mobilization meeting at the Detroit-Leland Hotel in Detroit on December 12. Mr. Tigges, who is also vice-president of Baker Brothers, Toledo, Ohio, will talk at the dinner on "Industrial Mobilization."

Speakers at the general forum in the afternoon session will include J. G. Sipe, Chief Procurement Officer, Detroit Arsenal, discussing "Government Contract Problems"; Robert Vartan, Price-Waterhouse & Co., talking on "Accounting Problems in Engineering Work"; T. Hermansen, Chief Enforcement Attorney, Wages and Hours Division, Detroit, who will discuss "Wages and Hours Regulations"; and O. K. Fjetland, Director of the Michigan State Employment Service, whose subject will be "National Employment Problems and Regulations."

One of the projects of the Association is the compilation of a national index of engineering services and total capacities available in individual engineering companies in the United States. Headquarters of the Association are at 1601-13 Dime Bldg., Detroit 26, Mich.



Interior view in the new Elgin plant of Shakeproof, Inc., Division of Illinois Tool Works, showing mass production equipment installed for turning out the line of fastening devices made by the company

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Special Vise Jaws for Milling Three Angular Surfaces

By ROBERT MERY
Liberty Products Corporation, Farmingdale, L. I., N. Y.

The special low-cost vise jaws shown in the illustration facilitate the milling of three angular surfaces on a work-piece in one set-up. A slot 5/8 inch wide by 1 3/4 inches deep is milled in the top of the part in one operation, and 5/16-inch by 45-degree chamfers are milled in the bottom of the slot at both ends in subsequent cuts.

The work is located for the various cuts by pushing a plug into a hole in one face of the work-piece, through one of the three index-holes *A*, *B*, and *C* drilled in the movable jaw. The large bore of the part is in contact with three of the four pins pressed into the lower portion of this jaw. To mill the slot, the work is lifted until the bore contacts pins *D*, *E*, and *G;* the plug is then pushed through index-hole *A;* and the vise is closed, as seen at *X*.

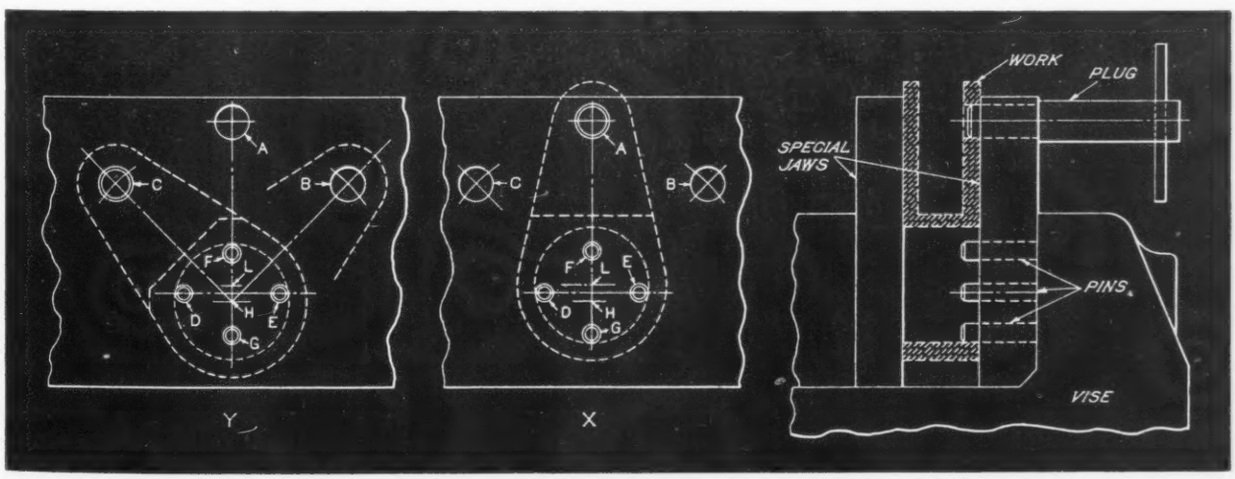
At the completion of the slotting operation, the vise is opened slightly, the plug is withdrawn, the work is pivoted, and then, with the bore in contact with pins *D*, *E*, and *F*, the plug is pushed through index-hole *B*. When the vise is again closed, the work is in position for milling one of the chamfers. The procedure is repeated, swinging the work to the opposite side of its central position and relocating the plug in index-hole *C*, for milling the other chamfer. In this way, the vise has to be fully opened only once, to unload the milled part and reload a new work-piece.

The centers of pins *D*, *E*, and *G* lie equidistant from a theoretical centerpoint *L*, and the centers of pins *D*, *E*, and *F* are equidistant from centerpoint *H*. A common center line between pins *D* and *E* lies midway between points *L* and *H*. Thus, three of the four pins contact the bore of the part in each index position. Point *L* represents the center of the bore during slotting, and point *H* during chamfering. Distance *LA*, of course, equals distances *CH* and *BH*. Angles *BHA* and *CHA* are 45 degrees.

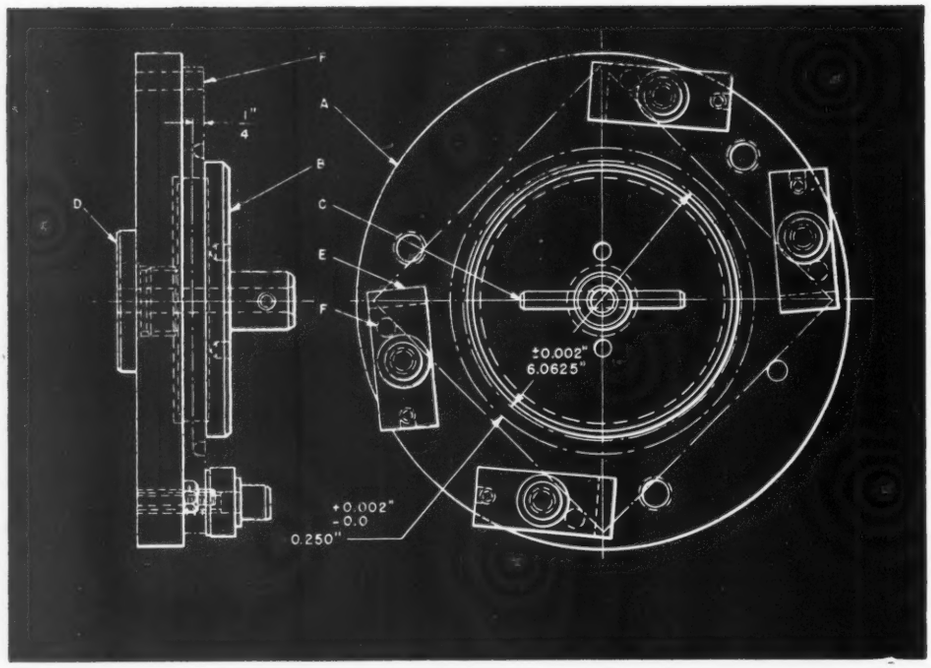
Lathe Fixture for Grooving Square Work

By ROBERT MAWSON, Providence, R. I.

A fixture designed for performing a grooving operation on a square machine-steel part in a lathe is shown in the accompanying illustration (see next page). The work is indicated by dot-



Special vise jaws equipped with locating pins and an index plug permit slotting and chamfering a work-piece without removing it from the vise



Lathe faceplate fixture that accurately locates a square work-piece for machining an annular groove

and-dash lines. Prior to this operation, the piece was accurately bored, two sides faced, and the edges machined to a square outline. By the use of this fixture, the width of the groove and its position were held to the tolerances shown on the drawing.

The fixture consists of a cast-iron plate *A*, which is finish-machined all over and has a threaded hole in the center to engage the plug clamp *B*. Three equally spaced holes are provided in plate *A* to fasten it to the lathe faceplate with 5/8–11 bolts. A hardened locating plug *D* is attached to plate *A* for positioning it on the faceplate. The plug clamp is made of machine steel, finished all over, carburized, and then ground on the diameter that fits the bored hole in the work-piece. It is also ground on the surface that is in contact with the flat face of the work. One end of plug clamp *B* is threaded to fit plate *A* and the opposite end is drilled to rereceive a removable handle *C* for tightening the work-piece in position. Two holes are also provided in the plug clamp for a pin type wrench to use when it is necessary to exert pressure greater than that which can be applied by using the handle.

Reamed holes in the center of the plug clamp and the locating plug *D* permit the assembled fixture to be mounted on an arbor and turned to bring the fixture to the proper balance. The work is held on the fixture faceplate by means of four hardened steel spring-loaded clamps *E*, which can be adjusted to provide the best work-holding position and then locked. Dowel-pins *F* in plate *A* contact the edges of the work to position it properly under the clamps.

In use, the fixture is located on the lathe faceplate by means of plug *D*, after which it is bolted securely in place. One of the work-pieces to be machined is then placed inside the four dowel-pins *F*, and the plug clamp *B* is screwed into the threaded hole in the fixture plate, the ground diameter of the clamp fitting the hole in the piece. It can be seen that the dowel-pins serve to center the work so that the plug clamp can be easily inserted in the fixture plate.

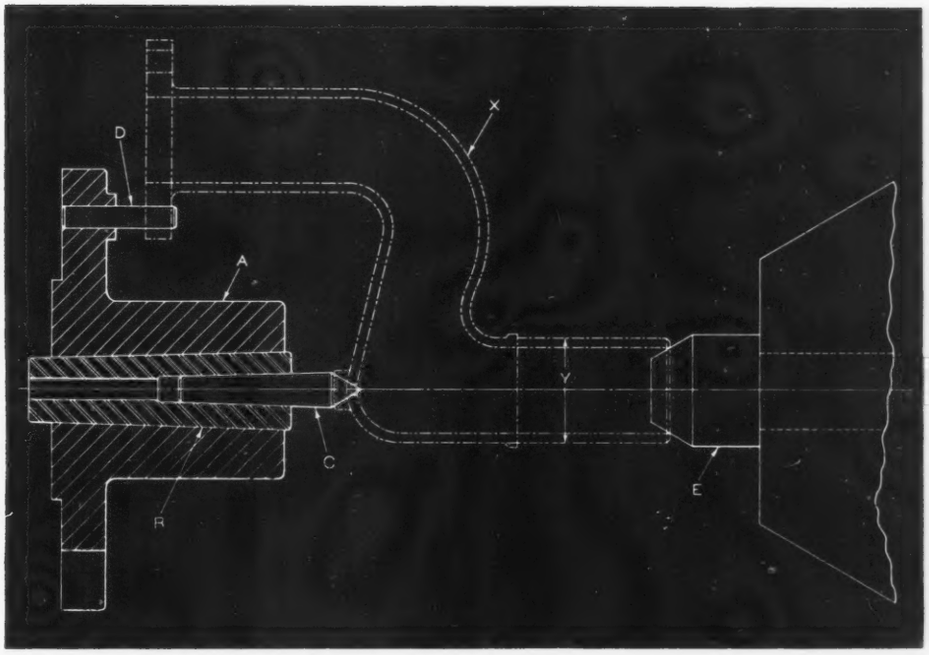
The four clamps *E* are then moved into position and tightened on the work-piece, which is now correctly located and securely held for the grooving operation.

Fixture for Turning Awkward-Shaped Piece

By IRVING MANSFIELD

In designing high-production jigs and fixtures, it is generally wise to utilize purchased parts wherever possible. As a rule, this is more economical than making the parts, and, in addition, commercially available components are easily replaced when broken or worn out.

An example of a fixture in which such parts are used may be seen in the accompanying illustration. The work *X* is a cast-iron exhaust elbow. Diameter *Y* is to be turned for a hose connection. Although accuracy is not of prime importance, it is necessary to have a smooth surface in order to prevent leaks. For this reason, a rigid clamping method is needed to prevent

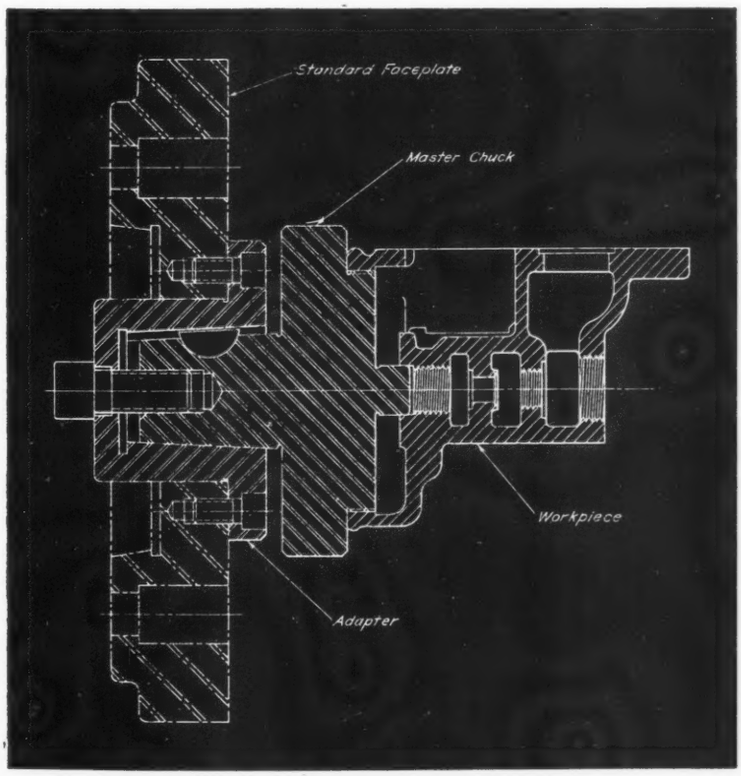


A simple fixture, made up principally of commercially available parts, which was designed to hold an awkward-shaped piece for turning on a turret lathe

chatter and tool marks. The work-holding fixture used in performing this operation is comparatively simple in construction, considering the awkward shape of the work.

The fixture body *A*, the only item not purchased, is made of cast iron. It has a flange which is finish-machined on the back face and turned to provide a step that acts as a pilot in a hole in the faceplate of a turret lathe. Three equally spaced cast slots are provided in the body for use in bolting the fixture to the machine.

The bore of the fixture is reamed to fit a Morse taper drill sleeve *B*. Center *C*, contained in the sleeve, enters a cast countersunk drain-hole in the work. A hardened and ground dowel-pin *D* is pressed into the flange of the fixture and fits into one of the previously drilled flange holes in the work to serve as a driver. A standard ball-bearing live center *E* is mounted in the hexagon turret of the lathe, and pilots in the inside diameter of the work, providing rigid support while the turning tool is cutting.



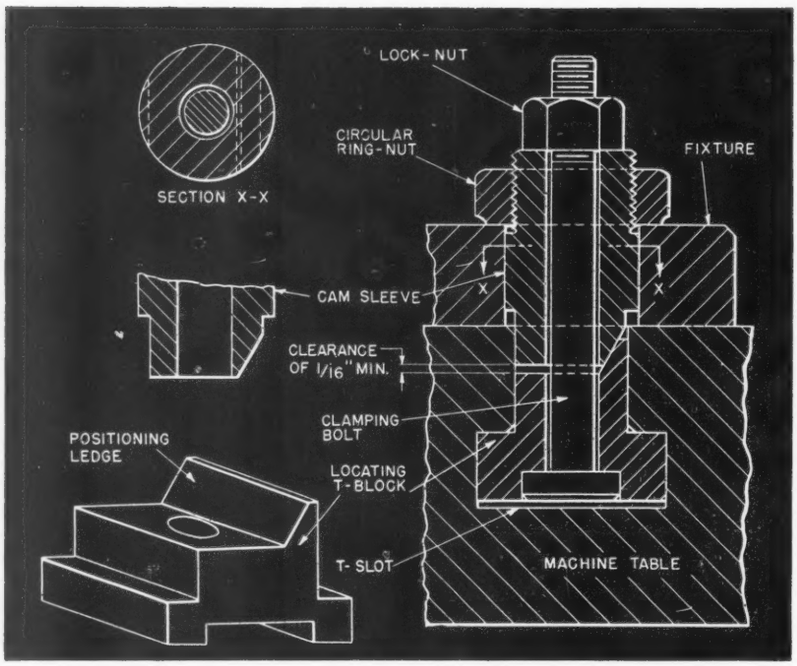
Master chucks and adapters used in machining irregular-shaped work

Chucks and Adapters for Machining Unsymmetrical Work

By ROBERT W. NEWTON
Assistant Chief Tool Designer
New York Air Brake Co., Watertown, N. Y.

Machining irregular-shaped work in large quantities often necessitates the use of special holding fixtures that will locate the work accurately and securely. The master chuck illustrated was especially designed for the unsymmetrical piece shown. The chuck is provided with a threaded stud that engages a tapped hole in the work. A pilot on the stud fits a counterbored section of the tapped hole.

At the opposite end of the chuck,



Simple clamp for reducing set-up time and insuring accurate alignment when several fixtures are to be clamped on one machine table

a shank, tapered to 1.000 inch per foot, fits a hole in an adapter that is fastened by screws to a standard faceplate. To fasten the chuck securely to the adapter, a screw engages a tapped hole in the tapered shank. This tapped hole is provided with a center, so that the shank, pilot, and thread can be ground concentric with the outside diameter of the chuck. The Woodruff key indicated is used for driving when heavy cuts are to be made.

It will be evident that chucks of this type can be made to suit any work-piece using either male or female threads. Also, several different chucks, for various kinds of work-pieces, can be made to suit an adapter for which standard faceplates have been bored and tapped.

Simple Clamp for Accurately Locating Fixtures on a Machine Table

By W. M. HALLIDAY, Birkdale, Southport, England

Conventional methods of clamping several fixtures or jigs in their proper relative locations on a machine table often leave much to be desired. In using tongues, T-nuts, or T-bolts, clearance must be provided between their faces and the surfaces of the T-slot in the machine table, so that the fixture can be slid along the table readily. This initial clearance becomes greater with repeated use of the fixture, due to wear. Setting-up difficulties or errors in the finish-machined parts often result from variations in the clearance of individual nuts or bolts and the consequent difference in the settings of respective fixtures.

By means of the simple clamp illustrated, setting-up time can be appreciably reduced and closer accuracies maintained. In clamping with two or more of such devices, the fixture will always be drawn against one side of the T-slot, regardless of the amount of clearance. Thus, every fixture will be correctly aligned with other fixtures on the same table, as each one is located from the same side of the T-slot. Wear will be reduced to a minimum, affording prolonged accuracy, with ease of operation.

The construction of the clamping device is as follows: Fitting into the conventional T-slot in the machine table is a hardened and tempered cast-steel locating T-block. The T-block is of rectangular cross-section, as shown in the view at the lower left, with one edge of its tongue machined to provide a flat positioning ledge. The polished face of the ledge is inclined at an angle of 60 degrees from the horizontal plane. The block should be a snug sliding fit within the T-slot, clearance being kept as small as possible. A standard square-headed clamping bolt is inserted through a hole in the center of the T-block, with the head of the bolt fitting closely into a slot machined across the under side of the T-block.

A cylindrical cam-sleeve, which is a sliding fit in a hole bored through the lug of the fixture, is drilled to provide a clearance of at least 1/32 inch for the clamping bolt. Two flats are machined on the lower end of this sleeve, the flat on the left being machined so that it will be in vertical alignment with the left-hand edge of the T-block. The lower portion of the flat on the opposite side of the sleeve is inclined at an angle of 60 degrees, as shown, to mate with the positioning ledge on the T-block. Both the left-hand flat and the right-hand inclined surfaces should be hardened and polished, since they are the parts most subject to friction and wear. A clearance of 1/16 inch should be provided between the lower face of the sleeve and the top surface of the T-block, as indicated.

The upper end of the cam-sleeve, which projects beyond the top face of the fixture lug, is

provided with a fine-pitch external thread to accommodate the circular ring-nut. The periphery of the ring-nut is knurled to facilitate rotating it by hand. A standard hexagonal lock-nut is screwed on the upper threaded end of the clamping bolt.

In the illustration, the fixture and parts of the clamp are shown in their correct relative positions when the fixture has been properly located and clamped to the machine table. The cam-sleeve has been moved downward by simply tightening the lock-nut. This movement causes the inclined flat on the right-hand side of the sleeve to contact the positioning ledge on the T-block, thus pressing the fixture toward the left until it is stopped by the flat on the left-hand edge of the sleeve coming into contact with the side of the T-slot in the machine table. When tightening the lock-nut, the ring-nut should be backed off slightly to clear the top surface of the fixture lug and allow the sleeve to pass through the hole in the lug.

When the fixture has been thus aligned, the ring-nut is tightened—by hand pressure only—and the lock-nut is then given a final, partial turn to insure rigid clamping and positive alignment of the fixture with relation to one side of the T-slot. The ring-nut prevents the cam-sleeve from being pressed too forcibly against the positioning ledge on the T-block.

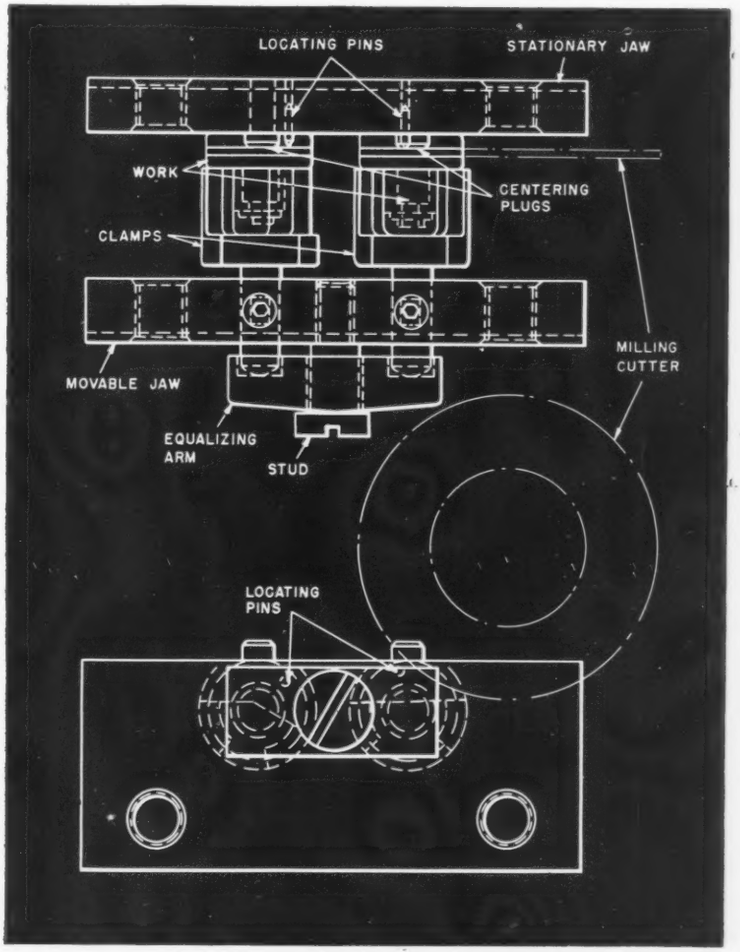
Two-Station Milling Fixture with Equalized Clamping Pressure

By A. C. EAGLE, Dayton, Ohio

The two-station milling fixture illustrated was designed for slotting the parts indicated, two operations being required in order to form the bottom of each slot to an included angle of 143 degrees 30 minutes. A plug and pin, pressed into the stationary jaw at each of the two stations, enter the bore and a reamed hole in the part to centralize and locate the part angularly.

Pressure is transmitted to the two clamps, which are free to slide in the movable jaw of the fixture, through an equalizing arm. This arm pivots on the stud to equalize the pressure exerted on each part when the thickness of the parts varies.

After milling a straight-bottomed slot in the part at the first station, seen at the right, the part is rotated slightly and located on the pin and plug at the other station for milling the second slot at the required angle with the first. A part is completed with each pass of the milling cutter.



A two-station milling fixture employed for angular slotting of the parts shown. Equalized clamping pressure is provided to take care of variations in width of the work

* * *

New Metal Treating Magazine

The Metal Treating Institute, New Rochelle, N. Y., has begun the publication of a monthly magazine known as *Metal Treating*, which is to be the official journal of the organization. The purpose of the new publication is to further the art and industry of commercial heat-treating, as well as to serve member companies with technical information, reports of activities, etc.

* * *

Inconel, a nickel-chromium-iron alloy, is used in the production of jet engine domes, liners, and transition sections.

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER
Lester and Silver
Sales Management Engineers
New York and Philadelphia

The Weather Vane Points to Change

THE business weather vane has been pointing to "change." What does this mean in selling manufacturing equipment?

We are faced with a new tempo in buying. Civilian demand has jumped ahead due to military programs. The fear of shortage engendered by past war experience makes everyone think ahead for self-protection.

Before long the demand for machine tools for actual military production will be a stark reality. New rules dictated by Government authority will soon complicate and harass the machine tool salesman. The urge toward creative selling —discovering the need and justifying the purchase—will be replaced by the urge to induce headquarters to accept this or that order.

Thus, again, almost every machinery salesman is faced with much the same market conditions as he was ten years ago. A "sucking market," where prospects are plentiful, takes the place of a market wherein the sales engineer must "blow the breath of life" into the hesitating prospect in order to kindle the flame of desire. With every indication that the demand for metal-working machinery will increase, what suggestions may help the salesman to meet these changed conditions effectively?

1. Once the writer took a long sea trip on an ore ship. In returning, we met a violent storm lasting four days. This landlubber neither slept nor ate. Keen hunger developed as we reached still waters. What was more natural than, upon landing, to seek a good restaurant and gorge a fine steak dinner. Several days, bed-ridden in a hotel, were needed to get back into shape.

In the same way, it may be easy to gorge oneself upon easily obtained orders, and later regret that one's capacity to handle more attractive and profitable business is gone. Therefore, let's lengthen our vision and sharpen our judgment by not letting the immediate cloud the future.

2. Let's carefully re-evaluate our immediate and probable future markets. Selective selling always involves sizing up each individual prospect. A dollar's worth of business from one customer may have a much greater value than the same amount of business from another customer, simply because the former may later be a more valuable and stable buyer. Identify and contact the potential buyer who presently will need machine tools or other machinery to take care of actual military demands. Watch out for the upstarts, opportunists, and "war babies."

3. Warn customers and prospects of lengthening deliveries. It is one thing to scare the prospect into buying—another to frankly discuss our present and probable future manufacturing facilities, so that best service can be given the substantial buyer.

4. Let's get a careful grasp as soon as we can of the exact rules under which orders for military preparation are to be placed. A full understanding of the new rules applying to depreciation of machine tools, for example, will not only strengthen customer confidence in us, shape our sales reasoning, but also point to the more likely and desirable prospects.

5. Keep our headquarters advised, both on the probable character and on the extent of the demand. We all know that the salesman who outlines prospective needs to his home office is likely to get best consideration and service.

6. In the event of delays in delivery, keep the purchaser informed in advance. Nothing is more annoying to the buyer who has made commitments and established his performance schedule than to be told at the last moment that shipment won't be made on the date specified.

7. Offer alternatives. Frequently, the prospect will be better served by accepting a standardized tool or one that can be obtained more easily and with less risk of delay.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Cincinnati "Filmatic" Heavy-Duty Plain and Roll Grinding Machines

Three new sizes have been added to the line of large plain and traveling table roll grinding machines built by Cincinnati Grinders Incorporated, Cincinnati, O. The new sizes include 16-inch heavy-duty and 20- and 24-inch plain grinders; and 16-, 20-, and 24-inch roll grinders. The new sizes serve to round out the Cincinnati line to include both standard-weight and heavy-duty machines in all sizes from 10- to 24-inch swing.

The grinding-wheel spindle bearings are of the "Filmatic" type used in preceding models of the company's line. This construction consists of segments that are free to rock slightly in the housing bore, thereby admitting wedge-shaped oil films between them and the spindle journal as the spindle rotates. The wedge-shaped films build up so as to exert high pressures, thus supporting the spindle on oil, eliminating the metal-to-metal contact, and adjusting themselves to the forces created by the grinding action.

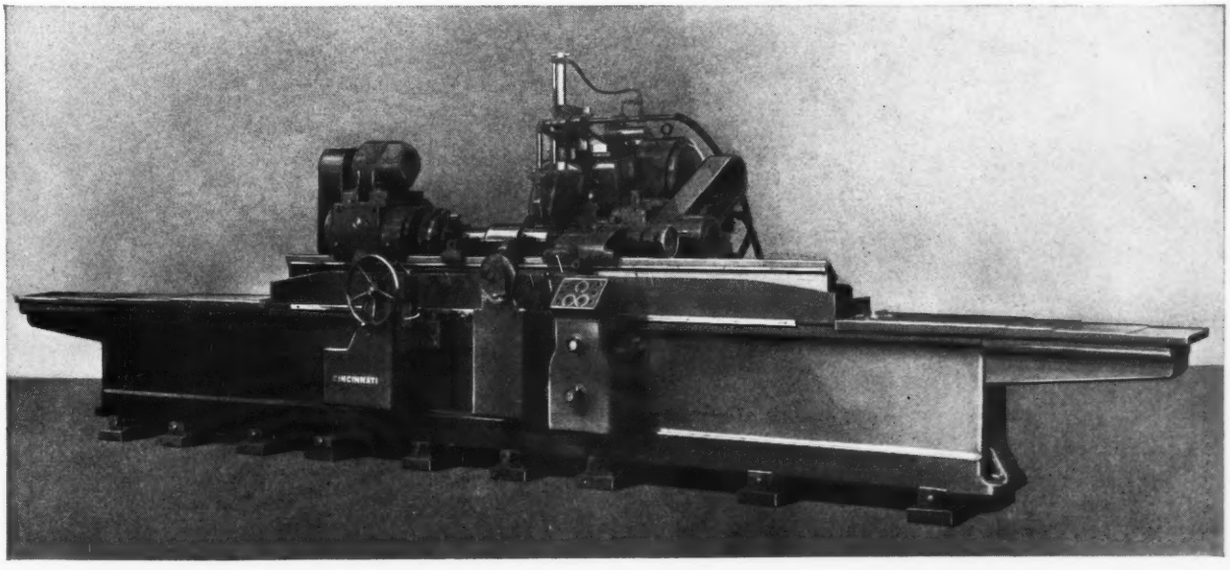
A direct-current motor, controlled electrically from an alternating-current source, drives the table through a rack and pinion. This drive permits dial selection of an infinite number of traverse rates from 3 to 120 inches per minute. The machine is designed to automatically reduce and accelerate the table rate of feed at reversal to eliminate shock. No mechanical clutches are employed. Table dwell or tarry can be adjusted independently at each end of the stroke.

Coolant flow and headstock spindle rotation automatically start and stop with the table traverse or can be arranged to operate independently if desired. All important bearings are automatically lubricated. An individual circulating system supplies filtered oil to the grinding-wheel spindle bearings, while a second circulating system automatically lubricates the table and crossways.

The headstock is of the dead-spindle, direct-current motor-driven unit type, having a speed range of 20 to 72 R.P.M. for the 16-inch size, and 15 to 24 R.P.M. for the 20- and 24-inch sizes. The taper hole in both headstock and footstock spindles is No. 15 B & S.

A wide selection of extra equipment is available for these machines, including automatic wheel-balancing and hydraulic profile wheel-truing devices. The roll grinding machines include power cross-feed to the wheel-head and tilting wheel-head type roll cambering mechanism. Adjustment for amount of camber is obtained through a double eccentric and change-gear arrangement.

Plain machines are built in seven lengths varying by increments of 2 feet from 48 to 192 inches, while the roll grinders are built in the same lengths up to 168 inches. Principal motor requirements are 20 H.P. for the wheel-head; 2 or 3 H.P. for the headstock; and 1 1/2 H.P. for the table-drive. 51



Heavy-duty grinding machine of new line introduced by Cincinnati Grinders, Inc.

To obtain additional information on equipment described here, use Inquiry Card on page 229.

Pratt & Whitney Cutter and Radius Grinder

An infinite variety of milling cutters, end-mills, and other tools can be sharpened on the new cutter and radius grinding machine announced by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn. This machine has a wide range of applications in tool, die, and machine shops, or wherever accuracy and sharpness of cutting tools must be maintained.

Stock and special tools that can be successfully ground from the blank or sharpened on this machine include die-sinking cutters; end-mills of all types; thread milling cutters; staggered-tooth milling cutters; Keller cutters and tracers; lathe, planer, and shaper form tools; special indicator points; profiling cutters; reamers; inserted-tooth milling cutters; slitting saws; radius and angle milling cutters; and many special form tools.

Simplicity of design permits quick set-up and easy operation of this grinder. Longitudinal slides and cross-slides on both the work-holding unit and the main spindle assembly and a vertical slide on the latter provide exceptional maneuverability. All movements are governed by positive stops and locks.

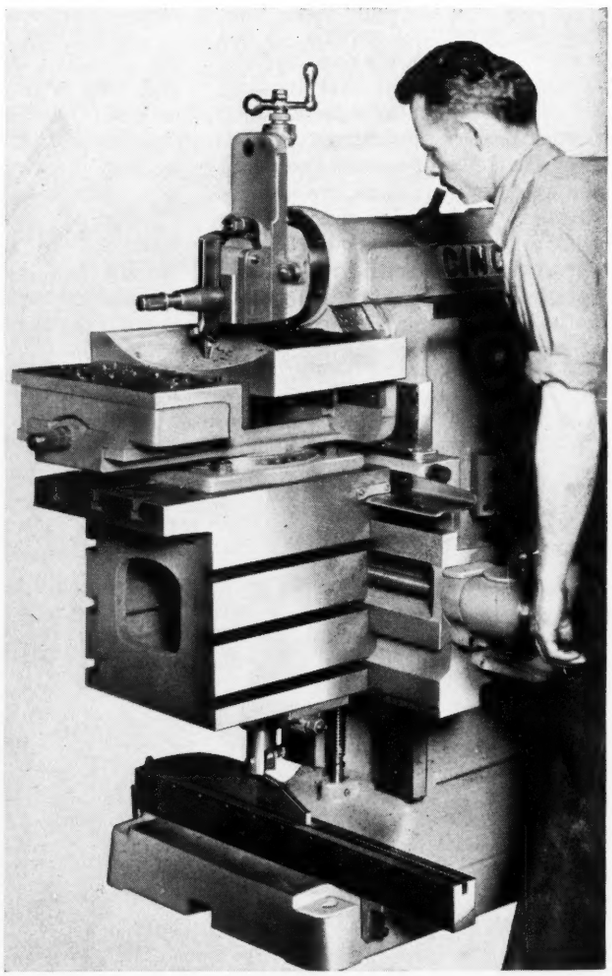
Provision is made for grinding not only conventional straight and spiral teeth, but also various combinations of radii, angles, and spirals encountered in die and mold making cutters. The work-holding unit is mounted on an accurately graduated swivel base, which enables the operator to easily blend ball-nose and radius-nose grinds into perfect tangency with the side teeth of an end-mill, and to produce draft angles on straight or spiral flutes.

The new grinder is available in two types—the R-6, having a flute length capacity of 4 1/2 inches; and the R-8, which will take flutes up to 10 inches long. The latter machine will accommodate Brown & Sharpe taper shanks up to No. 12, while the former will take shanks up to No. 9 B & S, as regularly equipped, and with added equipment, up to No. 12.....52

Cincinnati Shaper for Duplicating Contours on Metal Parts

A low-cost follower type shaper for duplicating contours on metal parts has recently been brought out by the Cincinnati Shaper Co., Cincinnati, Ohio. The new machine is shown in the accompanying illustration equipped for automatically shaping contours on dies, clamps, cams, and other parts. This arrangement eliminates the necessity for laying out the contour on the work and shap-

Cutter and radius grinding machine of versatile design announced by Pratt & Whitney



Shaper for duplicating contours on metal parts, brought out by Cincinnati Shaper Co.

To obtain additional information on equipment described here, use Inquiry Card on page 229.

ing to a line in the conventional manner.

The follower equipment can be supplied on Cincinnati shapers of any stroke or size. The new shaper is a standard machine, except for the pad on the base, the master form holder, and a special table support post. It can be used for regular shaper work, as well as automatic duplicating, change-over being simply and quickly accomplished.

The rail elevating screw is disconnected and retracted when duplicating, so that the table and rail are free to move vertically. The rail and table are supported on the master form by a steel post equipped with a roller. The master form to be duplicated is made of steel, 1/2 inch thick, and clamped in the holder, which is secured to the pad on the base. The table is traversed horizontally by automatic feed, the table, rail, and work following the vertical and horizontal movements of the roller as it travels over the master form.

A die such as shown in the illustration is machined by feeding the tool-slide down in consecutive cuts to rough out the contour, after which a final finish cut is taken with the duplicating follower arrangement to complete the surface. The limiting angle of climb is about 20 degrees. 53

"Press-Rite" Open-Back Inclinable Press

A new No. 1 1/2 15-ton open-back inclinable press has just been added to the line of "Press-Rite" machines previously placed on the market by the Sales Service Machine Tool Co., St. Paul, Minn. This positive, single-stroke type press has a sliding key clutch with a four-point engagement ring and a roller-bearing mounted flywheel. The standard stroke is 2 inches, but strokes up to 3 inches are available if required.

The flywheel is 20 1/4 inches in diameter, weighs 190 pounds, and is driven at a speed of 160 R.P.M. by a 3/4-H.P., 1140-R.P.M. motor. The bolster area is 10 by 14 3/8 inches, and the distance from bolster to slide with the stroke down and adjustment up is 6 3/4 inches. The throat depth is 5 1/2 inches. The press occupies a floor space 23 by 26 inches, and with the motor weighs 1100 pounds. 54

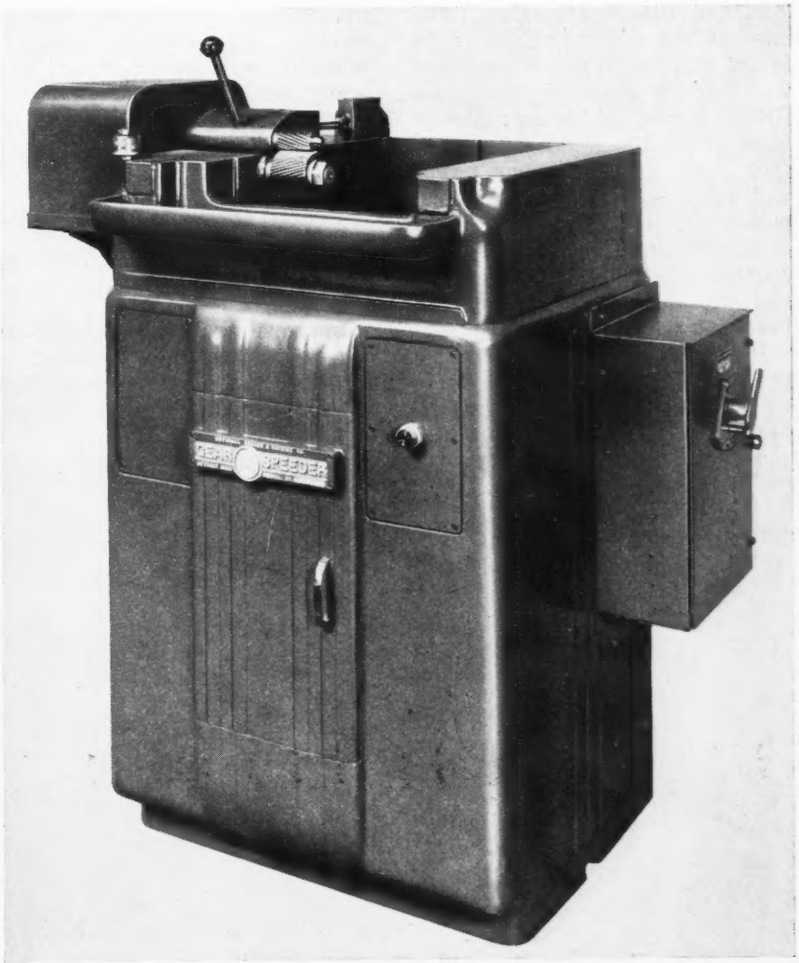
Rapid-Action Gear-Testing Machine

The National Broach & Machine Co., Detroit, Mich., has developed a new Red Ring rapid-action gear-testing machine. The particular machine shown in the illustration is now being used by one of the large automotive gear manufacturers to test automatic transmission planet pinions for nicks by running them in mesh with a master gear. The rapid rate at which pinions are tested is made possible by the improved design features of the machine. A power spindle, on which the master gear is mounted, drives the work-pinion, which is merely slipped on its spindle in the rocking work-head. No work-fastener is needed.

The work-head rocks about a central fulcrum, a compression spring normally holding it at an elevation which allows the pinion and master gear to be in very loose mesh, so that the work-pinion can be slipped on and off readily. In this position, an electrical interlock prevents the power from being turned on. With the work-pinion on its spindle and in loose mesh with the master gear, the rocking handle is pulled forward to bring the two gears in close mesh or to a predetermined center distance, and, at the same time, to release the interlock.

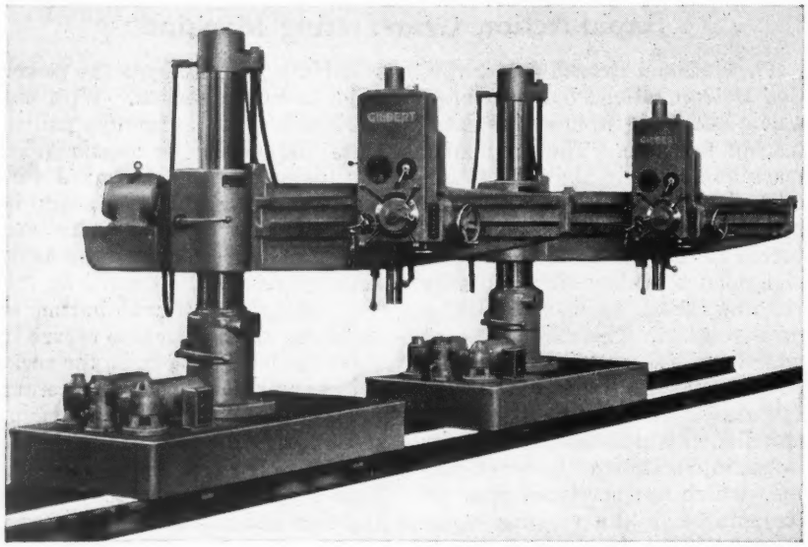
Pressing the "start" button at the right of the machine serves to start the test. As soon as the rocking handle is allowed to return to its initial position, power is cut off and a solenoid-operated brake immediately stops the rotation of both gear and pinion for unloading and reloading the next work-piece.

Although the gears are tested very rapidly, the operator is fully protected—first, because both his hands are occupied with machine controls while the power is on, and, second, because the brake action takes place immediately when the power is cut off. 55



Rapid-action gear-testing machine developed by the National Broach & Machine Co.

To obtain additional information on equipment described here, use Inquiry Card on page 229.



Cincinnati Gilbert radial drilling machines with traveling base

Radial Drilling Machines with Traveling Roller-Bearing Mounted Base

Improved flexibility is offered by the new track-mounted radial drilling machines brought out by the Cincinnati Gilbert Machine Tool Co., Cincinnati, Ohio. The base of the new machines is 46 inches wide by 90 inches long, and will ride on standard Cincinnati Gilbert horizontal boring mill runways or on 100-pound rails of 3-foot gage. All necessary power and electrical equipment is completely enclosed in the unit. Traverse, clamping, and coolant-pump controls are mounted on the base and are duplicated on the drill head for operator convenience.

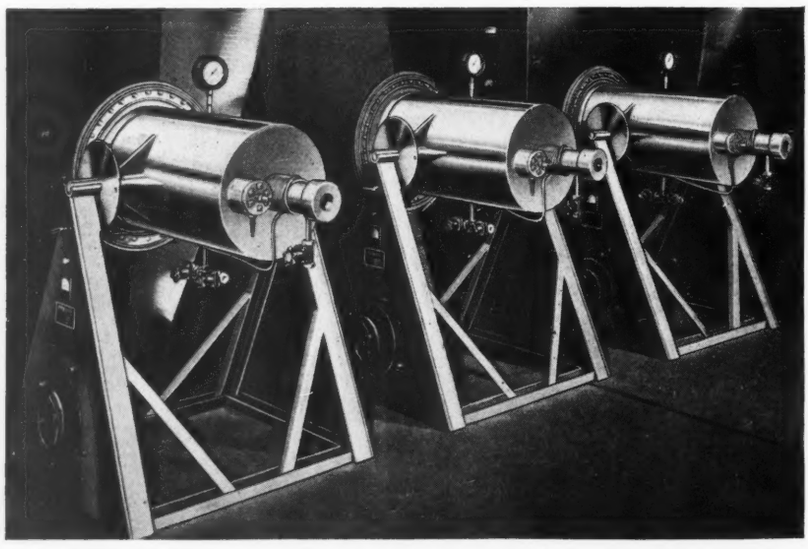
Power traversing and clamping equipment is optional on these machines. Under power, the unit traverses at the rate of 50 feet per minute. The traversing mechanism consists of a 1 1/2-H.P., 960-R.P.M. motor adaptable to alternating- or direct-current operation; a reversing control; worm-driven speed reducer; and heavy bevel gears for the final drive. All mechanisms run in oil or are permanently lubricated.—56

Pereco Improved Molybdenum-Vacuum Sintering Furnace

Improvements incorporated in the new ultra high-temperature Pereco molybdenum-vacuum furnace announced by the Pereny Equipment Co., Columbus, Ohio, are said to have greatly simplified the loading and unloading of the work and the removal and replacement of the heating elements. This Model MO-224 dual-tube electric furnace has a maximum temperature of 3300 degrees F., with a neutral to reducing atmosphere pure enough to sinter chromium without oxidation. The steel case maintains a vacuum of 30 inches of mercury indefinitely.

The molybdenum heating element compensates for heat gradient at both ends of the tube, which has a working area of 2 inches inside diameter by 28 inches long, with 18 inches of controlled-temperature length. The furnace can be obtained with sight-tubes on one or both ends. The Pyrex or quartz sight lens can be removed easily from the 10-inch vestibule or sight-tube for mounting thermo-couples or other equipment.

The cylindrical furnace may be rotated and locked for operation in either the horizontal or vertical position. Over-all size is 20 inches in diameter by 40 1/2 inches in length. Power input is 6 KW, 220 volts, 60-cycle, single-phase. Connections are provided for atmosphere, vacuum, and water.—57



Improved sintering furnaces brought out by the Pereny Equipment Co.

Columbia Open-Back Inclinable and Gap Presses

A line of single-crank open back inclinable and gap presses is being added to the line of power press brakes and steel squaring shears manufactured by the Columbia Machinery & Engineering Corporation, Hamilton, Ohio. The open-back inclinable presses are designed for stamping, drawing, blanking, coining, and embossing, and are made in a complete range of sizes from 10 to 200 tons capacity, inclusive. The gap presses are made in capacities of 60 to 200 tons. Two basic designs are employed, one for presses up to 45 tons capacity, and the other for the larger units.

The smaller presses have a cone type clutch located on the crankshaft. This clutch is much lighter and more compact than the friction disk clutches formerly employed. Thus the flywheel effect is greatly reduced, with a corresponding decrease in starting current consumption, heat generation,

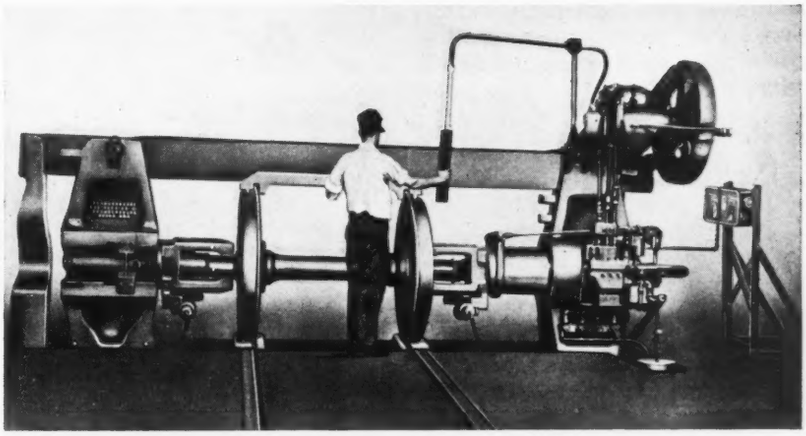
To obtain additional information on equipment described here, use Inquiry Card on page 229.

and wear on the clutch and brake linings.

Both open-back inclinable and gap presses in the larger sizes use a new patented "Alcone" aluminum cone type clutch. This clutch also greatly reduces size and weight, with a corresponding reduction in flywheel effect. The 12-degree cone is actuated by one-fifth the cylinder area required for friction disk clutch operation, permitting the use of a smaller, lighter cylinder. The "Alcone" design also permits adjustment for wear to be incorporated in the stationary parts. These features serve to further reduce the flywheel effect, permitting faster starting and stopping.

The inclinable presses can be tilted to a maximum of 25 degrees from the vertical. The point of suspension is so located as to minimize raising of the bed and to avoid awkward feeding positions when the press is inclined. The friction type knock-outs are especially designed to eliminate accidents due to set-up errors.

All models are V-belt driven with motor mounting, motor sheave, and V-belts furnished as standard equipment. Arrangements are made for push-button control on all models, although smaller units are regularly furnished with a mechanically operated air valve incorporating a single-stroke device. Push-button controls with "once," "inch," and "continuous" buttons can also be furnished on all models. 58



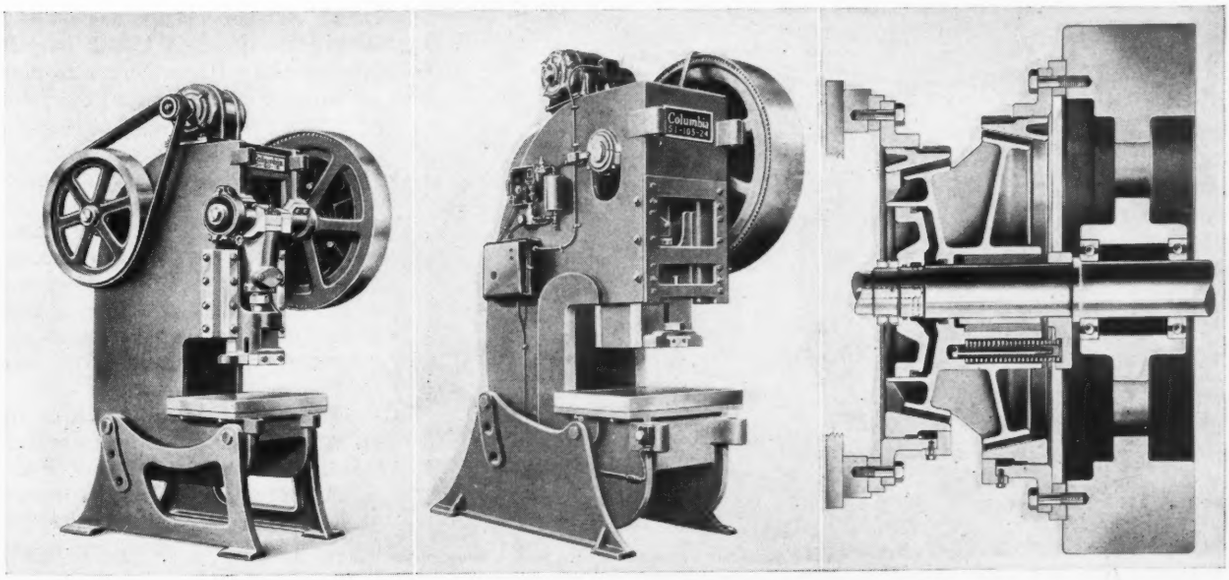
Push-button controlled press for production mounting of car wheels

Chambersburg Car-Wheel Mounting Press with Push-Button Control

The Chambersburg Engineering Co., Chambersburg, Pa., has announced a new car-wheel production mounting press, featuring centralized electrical push-button controls, by means of which all the operations necessary in pressing standard car wheels on their axles can be handled by a single operator. The push-buttons are mounted on a pendent suspended from an adjustable swing arm, which permits wide latitude in the operator's movements.

With this new equipment, one man can mount and gage the wheels from the same station, thus effecting a saving in labor over the conventional mounting press, which requires one man to do the gaging while another man operates the press by individual manual controls. The electrical controls on the new machine not only provide for the operation of the press ram, but also control the positioning of the stops in the yokes and operate the pneumatic "kick-out" cylinder in the resistance beam to push the completed assembly free of the yoke for rapid removal from the press.

The push-buttons, mounted one above the other on the pendent, are used to advance the ram quickly under air pressure; apply hydraulic pressure rapidly, moderately, or by inching; hold the pressure at any desired tonnage; instantaneously release all pres-



(Left) Columbia single-crank open-back inclinable press made in capacities up to 45 tons. (Center) Columbia single-crank open-back inclinable press made in capacities of 60 tons and larger. (Right) "Alcone" clutch used on new Columbia presses of 60 tons capacity and larger

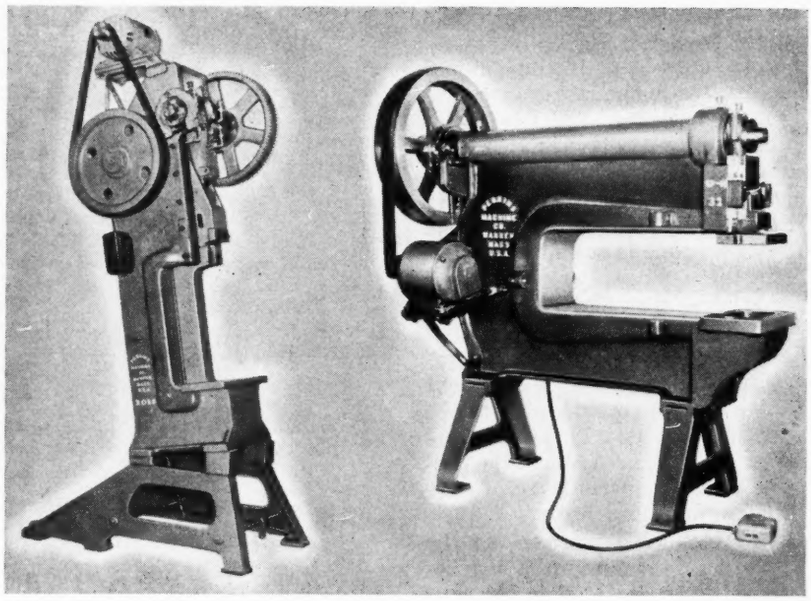
sure; position right-hand or left-hand stop within the mounting yokes; and operate the "kick-out" plunger.....59

Perkins Special-Purpose Presses

Two new extra-capacity, special-purpose presses have recently been brought out by the Perkins Machine Co., Warren, Mass. In designing these presses, special attention was given to obtaining versatility, economy of operation, low upkeep cost, convenience of operation, and accessibility of dies for quick changes.

The long-stroke 201-S press, shown at the left in the illustration, has an effective stroke of 7 inches and a throat clearance, from bed to ways, of 21 inches. The column is tilted back to provide for more convenient operation. The back-gear drive is powered by a 1-H.P. motor.

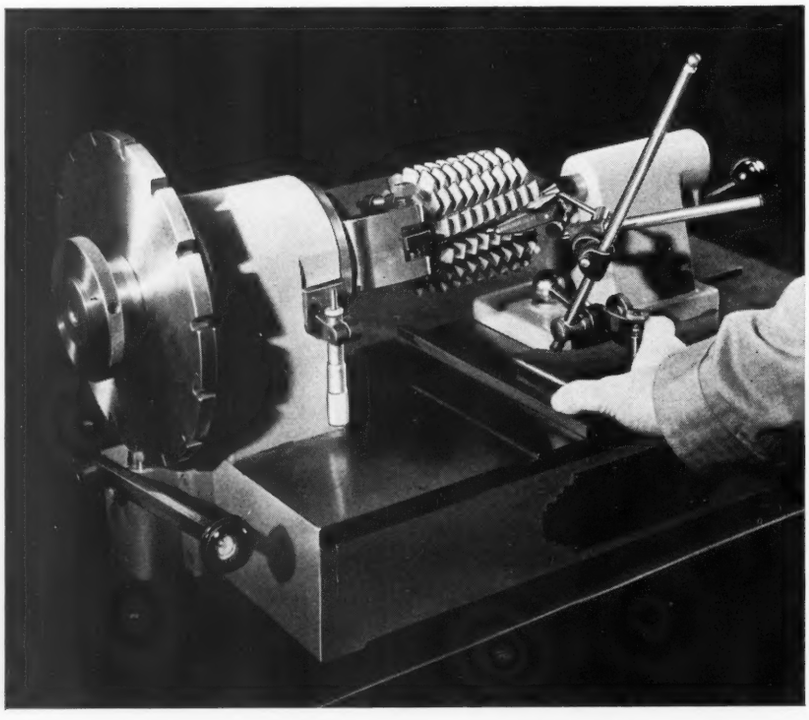
The deep-throated 10-M-32 press, shown at the right, is of simple rugged design, developed for higher production on a wide variety of work where extra throat capacity is required. It has a flywheel type of drive, powered by a 1 1/2-H.P. motor. As with the long-stroke press, all moving parts and the dies are readily accessible.....60



(Left) Perkins special-purpose press with long stroke capacity
(Right) Perkins special deep-throated press

Barber-Colman Hob-Sharpening Checker

The Barber-Colman Co., Rockford, Ill., has announced a hob-sharpening checker for measuring inaccuracies in hobs or form cutters that may result from face sharpening. This precision instrument inspects the hobs for "radialism," flute-to-flute spacing, total spacing, face offset, and accuracy of straight flutes with axis of hobs and cutters. It can also be used for checking run-out of faces and outside diameters of hubs, as well as the outside diameter run-out of the hob or cutter itself. The exact amount of error resulting from sharpening a hob can be accurately measured, thus simplifying the set-up work.



Hob-sharpening checker brought out by the Barber-Colman Co.

The new hob-sharpening checker is designed to utilize the standard index-plates of the Barber-Colman No. 10-12 hob-sharpening machine. These plates are 9 1/2 inches in diameter, and permit holding the adjacent error to plus or minus 0.0005 inch and the total error to plus or minus 0.0015 inch. Special precision plates are available which will hold the adjacent spacing error measurement to plus or minus 0.00025 inch and the non-adjacent error to plus or minus 0.001 inch. Because of the larger diameter of these index-plates, all errors at standard hob diameters are eliminated for practical inspection purposes.

Checking is done by means of an indicator mounted on a surface plate. The indicator finger is set on the exact center line by means of a gage-block mounted on the index-head. For checking negative and positive rake angles, a micrometer is built into the head, so that the indicator can be set off center. An alignment bar on the

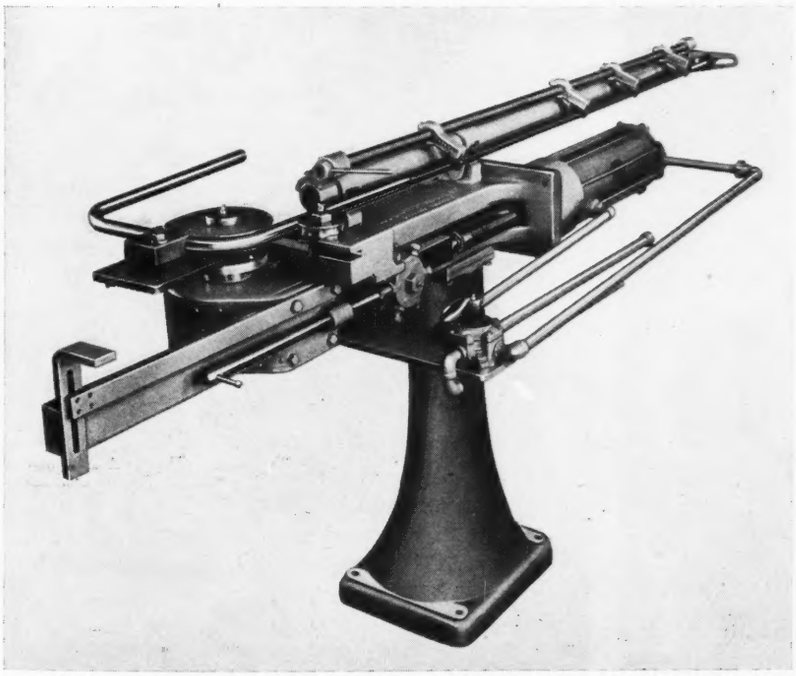
To obtain additional information on equipment described here, use Inquiry Card on page 229.

surface plate guides the indicator stand, so that it can be moved at right angles to the axis of the hob when checking the face of helical-gash tools. Toggle type mechanisms are utilized for both the index-plate pawl retractor and the tailstock center level. Extra heavy construction provides rigidity for checking large hobs and cutters and for resisting wear. ----------61

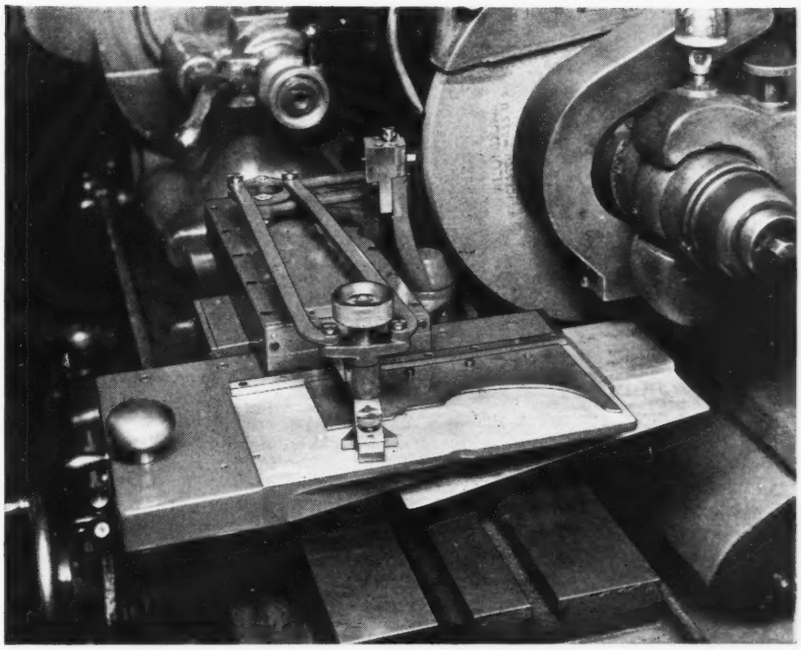
High-Speed Air-Powered Tube-Bending Machine

Up to 1000 bends per hour can be made in 1-inch 16-gage steel tubing with the improved "Bend-Ex" bending machine announced by the Paul Machine Tool & Die Works, Chicago, Ill. The new die and clamping head of this machine grips and bends the tube automatically.

The operation of this bender has been simplified and reduced to three quick steps. Unskilled operators are usually able to achieve maximum production within a few hours in bending round, square, and rectangular tubing; pipe; light angles; channels; solid bars; etc. As many as ten bends can be made in a single tube. Dies which are easily and quickly interchanged are available for bending tubing of different sizes and for making bends of different radii. ----------62



Air-powered tube-bending machine brought out by the Paul Machine Tool & Die Works



"Magni-Form" contour wheel dresser brought out by the Hoglund Engineering Co.

Hoglund "Magni-Form" Contour Wheel Dresser

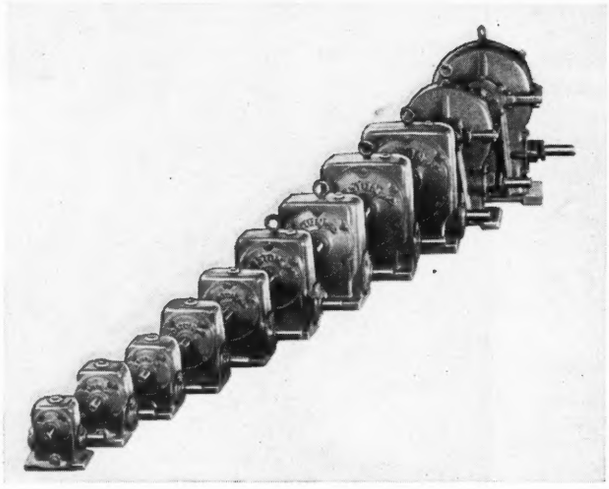
The Hoglund Engineering Co., Union, N. J., has just added to its line of "Magni-Form" grinding-wheel dressers a Model KB 14 universal contour wheel dresser for cylindrical grinders. This manually operated, high-precision abrasive-wheel dresser produces continuous complex contours across the full width of the wheel from a 10 to 1 or 5 to 1 ratio templet made of 1/16- to 3/16-inch thick sheet metal. The movements of the diamond are controlled through a simple mechanism by means of a stylus which follows the moving enlarged templet. The stylus and the diamond can be rotated together through a parallel mechanism to retain the most favorable relationship between the contour and the point of the diamond.

A microscope fixture with a 40 to 1 magnification is used to set the diamonds in their holders. Any wear in the diamond that might affect the accuracy of the work is clearly visible in the microscope. The diamonds are set in three holders in the microscope fixture. The microscope has four concentric circles, the innermost having a 0.005-inch radius, the next a 0.010-inch radius, the following a 0.015-inch radius, and the largest a 0.025-inch radius. Each circle corresponds a diamond of the same size, and each diamond is set to coincide with its particular circle.

With the roughing diamond on the dresser and the corresponding roughing stylus in place, the wheel is brought in front of the dresser. The templet table is then moved in and out with the left hand, keeping the stylus in contact with the templet with the right hand and at the same time rotating the

To obtain additional information on equipment described here, use Inquiry Card on page 229.

stylus so that it is kept about perpendicular to the contour of the templet. A few thousandths of an inch is removed by each pass of the diamond until the contour is fully dressed. The roughing diamond is then replaced with the largest finishing diamond that can enter the contour, and the stylus is changed to correspond with the diamond. The finish-dressing is now completed, removing 0.0005 inch per pass until all parts of the contour are cleaned up. 63



Line of improved speed reducers announced by Boston Gear Works

Gibbons Tube-Bending Press

A hydraulic press especially designed and equipped for tube-bending operations has been added to the line of the Gibbons Machine Co., Tipp City, Ohio. This press has an operating speed of twenty strokes per minute.

A multiple positive index stop for making angle bends of various degrees prevents over-run. The knee width, which is only 11 inches, permits making reverse bends 5 1/2 inches apart. The rocker die, three sets of rockers, and side arms are furnished with hydraulic pressure pads. The overhanging type ram, which operates in nickel cast-iron gibs, permits bending over the top of the punch. With this construction, all operating strains are removed from the cylinder packings and rings. The press requires a floor space of 28 square feet, is 105 1/2 inches high by 31 inches wide by 44 inches deep, and weighs 7930 pounds. 64

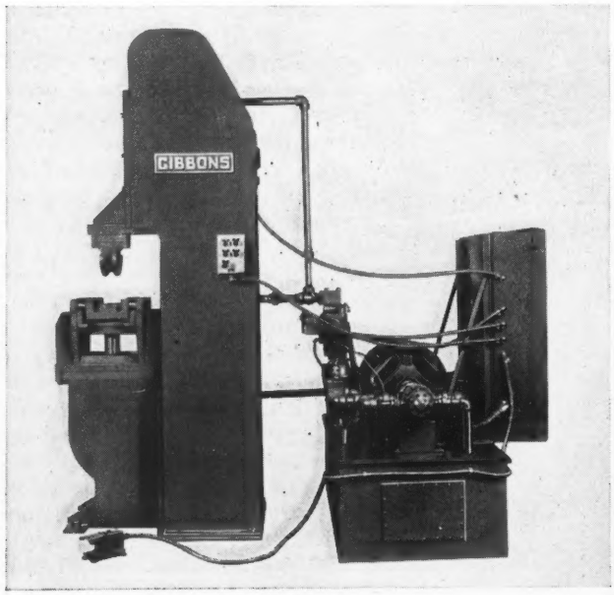
Improved Line of Speed Reducers

Boston Gear Works, Quincy, Mass., have announced the addition of an improved series of heavy-duty model "Reductors" to their line of speed reducers. The complete range of T series horizontal right-angle drive "Reductors" shown in the accompanying illustration is representative of these heavy-duty units, which are equipped with heavy Boston gears, worm integral with shaft, housings of Boston Gear iron and steel shafts.

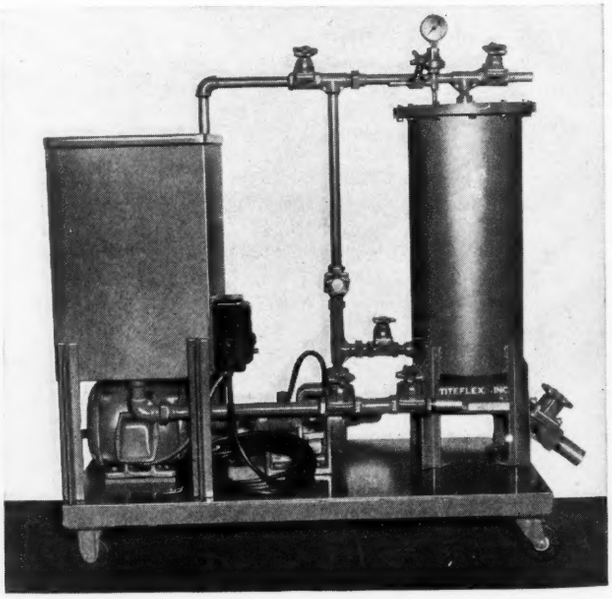
An improved numbering system facilitates selecting the correct "Reductor" for any speed reduction needed. There are eight types, each made in a range of speed ratios, horsepowers, and load carrying capacities. Gear ratios range from 1 to 1 up to 4000 to 1. Output speeds, based on full-load motor speeds, are 0.45 to 588.23 R.P.M. 65

Titeflex Filters

Fast, easy cleaning of the filtering elements, high flow rate capacities, and low operating costs are features claimed for the line of filters manufactured by Titeflex, Inc., Newark, N. J. These filters are designed to meet the needs of the machine tool, chemical, food, and other industries, as well as water supply systems, requiring filtering capacities ranging from 400 to 10,000 gallons per hour. All standard models are available in iron, stainless steel,



Tube-bending press added to the line of the Gibbons Machine Co.



New fast-cleaning filter placed on the market by Titeflex, Inc.

To obtain additional information on equipment described here, use Inquiry Card on page 229.

and rubber-lined types fitted with centrifugal pumps.

The Titeflex filters comprise a number of tubular-shaped membranes, 2 inches in diameter and varying in length according to the size of the filter. These filtering membranes are made in wire screen and wire mesh designs of stainless steel or other metals, and in porous stone.

The operation of the filters is simple. The pre-coat tank is first filled with clear liquid and the correct amount of "filter aid" is mixed in until it is in complete suspension. The pump is then started and the liquid and "filter aid" are pumped into the filter chamber. The membranes retain the "filter aid" on their outside surfaces and the clear liquid is returned to the pre-coat tank. Pre-coating is complete when the liquid in the pre-coat tank is clear.

The filtering process is started by merely turning the proper valves, the pre-coat tank not being used during the filtering operation. The solution to be filtered is pumped into the filter chamber where the sediment is deposited on the layer of "filter aid" and the clear liquid or filtrate is discharged. Suspended particles down to one-tenth of a micron in size are filtered out without affecting the taste, odor, color, or chemical composition of the liquid.

The filtering membranes are easily cleaned by back-washing or reversing the flow of liquid through them. 66

Kent Two-Spindle Bolt-Threading Machine

A two-spindle bolt-threading machine, especially designed for the rapid threading of screw blanks and other milled, upset, or forged parts having regular or irregular shaped heads, has been developed by the Kent Machine Co., Cuyahoga Falls, Ohio. This machine is designed to require a minimum of operating skill in continuous threading on long-run jobs and to permit quick change-over from one job to another.

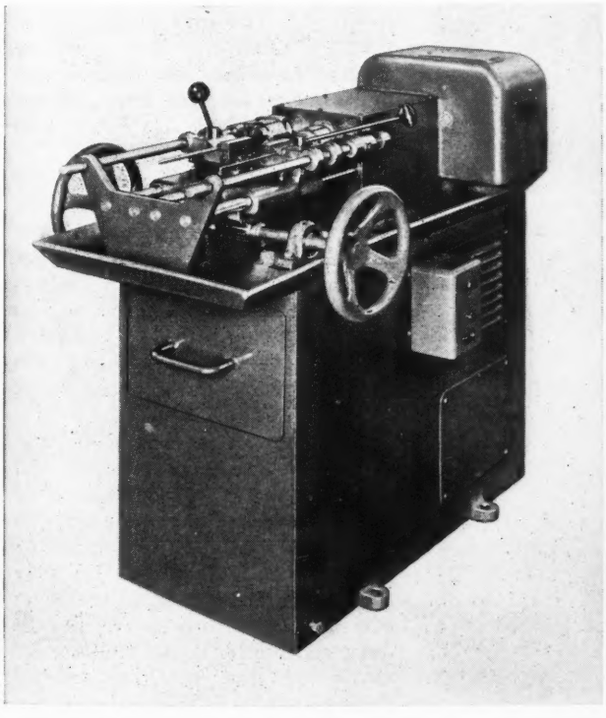
Work-holders designed to suit the pieces to be threaded are carried on two anti-friction slides which are parallel to the threading spindles. The blanks to be threaded are placed in the work-holders and advanced to the dies by handwheels. When the die begins to cut, forward pressure on the wheel is removed and the work is advanced by the lead of the thread itself. High production with a minimum of operator fatigue is obtained by alternate feeding of the two spindles.

A stop is adjusted to trip the die automatically when the thread is cut to the required length. Backward movement of the wheel for extracting threaded pieces and loading the blanks automatically closes the die.

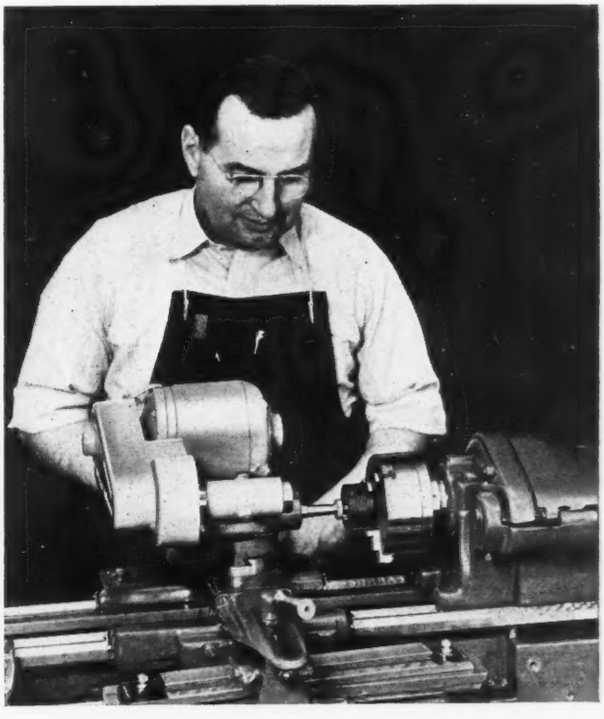
The spindles are driven through V-belts and change-gears from a 2-H.P., 1200-R.P.M. motor in the machine base. A pump forces a continuous flow of coolant outward from the spindles, so that the chips are washed out of the chasers. The machine will cut threads up to 6 inches in length on work up to 24 inches long. It has a capacity for cutting straight threads up to 1 inch in diameter and taper pipe threads up to 3/4 inch. The machine is 41 1/2 inches high by 43 inches long by 28 inches wide, and weighs 1025 pounds. 67

Internal Grinding Attachment for Lathes and Other Machine Tools

To meet the need for an internal grinding attachment having sufficient power to maintain constant wheel speed under varying loads and prevent stalling under comparatively heavy cuts, the South Bend Lathe Works, South Bend, Ind., has brought out the constant-speed precision grinder illustrated. This new internal grinder is driven by a standard



Kent two-spindle bolt-threading machine



South Bend internal grinding attachment for lathes

To obtain additional information on equipment described here, use Inquiry Card on page 229.

type, constant-speed, continuous-duty 1/6-H.P. alternating-current motor running at 3450 R.P.M.

A quill spindle speed of 30,000 R.P.M. is provided by a compound belt drive through an intermediate shaft. A drop of less than 1000 R.P.M. in spindle speed and a negligible power loss are said to occur when taking cuts as heavy as 0.003 inch on a side in hardened steel. The grinding wheel and intermediate shaft spindles are mounted in high-precision, high-speed ball bearings which require no adjustment. Lubrication is supplied from built-in oil wells. The bearings are sealed to prevent loss of oil and entrance of dust or other foreign matter. The drive, consisting of compound belting and two pulleys, is enclosed by a one-piece guard.

The attachment is supplied with four arbors, the longest of which permits grinding a hole 3 7/8 inches deep with a 1-inch wheel. Four grinding wheels for these arbors with 1/4-inch face, 1/4-inch bore, and 5/8-, 3/4-, 7/8-, and 1-inch diameters are included in the regular equipment.

In addition, a 1/8-inch chuck is supplied, so that various sizes and shapes of mounted grinding wheels can be used and holes can be ground as small as 1/8 inch in diameter. 68

Spinning Machine Designed for Production of Metal Cones for Television

The electrically controlled, hydraulically operated metal spinning machine shown in Fig. 1 is being built by the Northern Engineering & Machine Corporation, Philadelphia, Pa., for the production of stainless-steel cones for television. Two of the finished stainless-steel cones and a blank ready for the spinning operation are seen in Fig. 2. The view of the machine shows the mandrel over which the blank is formed to the conical shape by the metal-spinning rollers mounted on the hydraulically operated head.

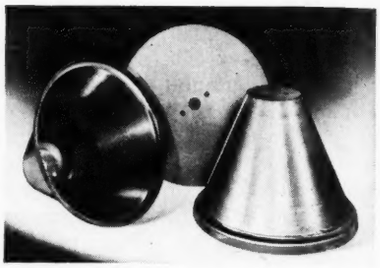


Fig. 2. Stainless-steel cones for television produced by metal spinning machine shown in Fig. 1

The electrical control panel is mounted on the inner side of the rear cabinet door. This door can be opened to expose the panel and the hydraulic valve system inside the cabinet. The push-button control station is located at the front of the machine, in a convenient position for the operator, as shown in Fig. 1. 69

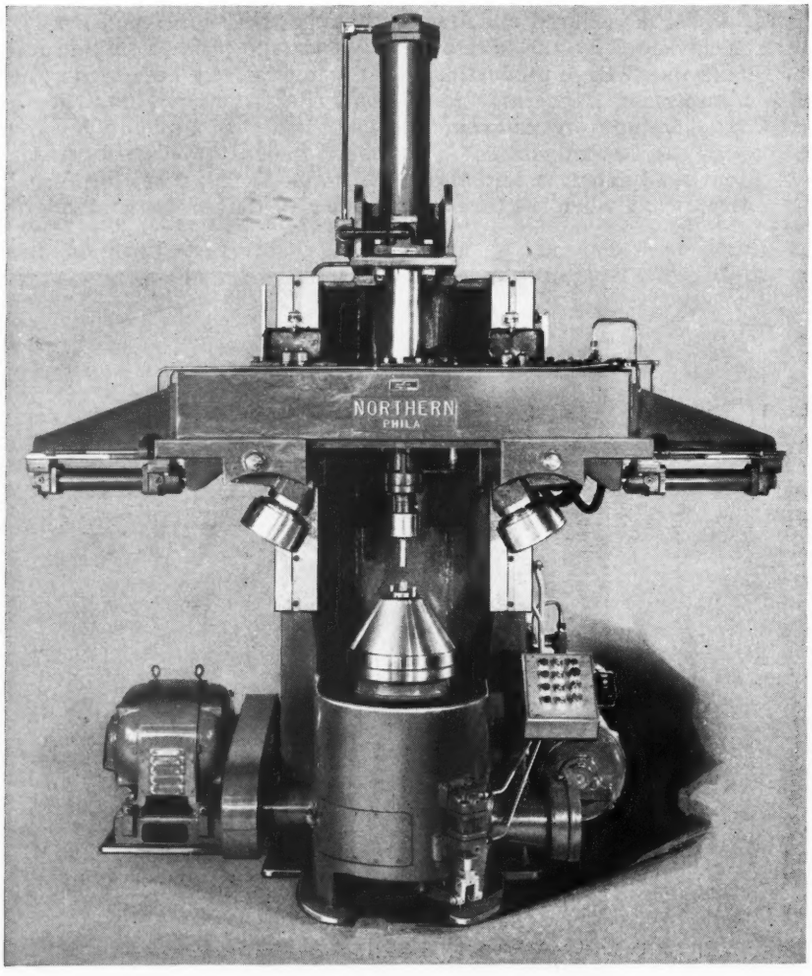


Fig. 1. Metal spinning machine built by Northern Engineering & Machine Corporation

Faceplate with Reduced Speed Drive for Giddings & Lewis Boring Machines

A new faceplate drive is now being manufactured by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., for use on its horizontal boring, drilling, and milling machines whenever increased power at lower speeds is desirable. The unit also provides greater flexibility for accurate machining of inaccessible surfaces and unusual internal and external shoulders, offsets, grooves, and recesses.

Tools, tool-holders, and special tooling set-ups can be rigidly mounted on the faceplate or the faceplate can be employed for holding and rotating the work-piece while tools mounted on the machine table are fed by the table movements. The faceplate is 30 inches in diameter and has eight radial T-slots on its working face.

The unit is mounted permanently on the headstock of the machine, and the faceplate drive is engaged or disengaged by means of a built-in clutch mechanism. This mechanism is operated by shifting a hand-crank on the back of the unit. The heavy-duty main spindle and the spindle sleeve of the machine extend through a hole in the center of the faceplate, permitting the spindle to be used interchangeably with

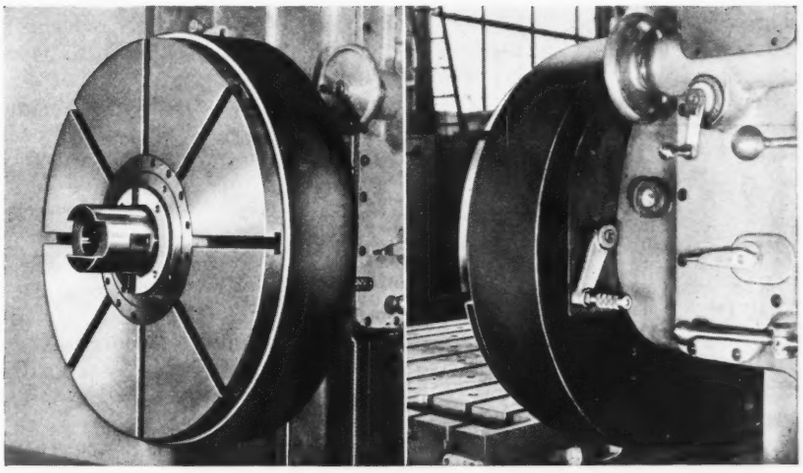
To obtain additional information on equipment described here, use Inquiry Card on page 229.

the faceplate drive. The spindle is retracted in its sleeve when not in use. When the faceplate is rotating, the spindle is stationary, and vice versa.

The faceplate drive provides a 4 to 1 reduction from the spindle of the machine, with a corresponding increase in power. When the spindle provides speeds from 8 to 480 R.P.M., for example, the faceplate can be operated at speeds of 2 to 120 R.P.M. This is advantageous in machining tough metals, such as stainless, chromium, and vanadium steels.

The faceplate is driven from the power or back-gear shaft of the machine. The pinion on the end of this shaft drives an internal ring gear located inside the drum housing of the unit. If the machine is equipped with an auxiliary high-speed spindle, this is disconnected and retracted when the faceplate drive unit is mounted on the headstock. The faceplate drive is mounted on its own anti-friction bearings in an extension of the spindle sleeve. This arrangement permits free rotation of the sleeve when the faceplate clutch is thrown out..

The working surface of the faceplate is precision-machined to insure accurate location of tools or work. The T-slots are planed to close tolerances, square with the surface and at right angles to the center of rotation. 70



Front and rear views of faceplate with reduced speed drive developed for Giddings & Lewis horizontal boring, drilling, and milling machines

The anti-friction ball bearings on which the table is mounted are carried in a Micarta track. The raising and lowering of the grinding wheel head and the cross-feeding of the head and column permit the sub-table and table to remain fixed as to vertical or transverse movement. This allows the operator to stand close to the work, and also permits the weight of the attachment and the work to be carried directly over the base.

The Bijur one-shot lubrication system and grease-sealed ball bearings on all rotating shafts and the greased-for-life, dust-tight, cartridge type, precision ball-bearing spindle eliminate "down" time and insure proper lubrication of all moving parts.

Grand Rapids Universal Cutter and Tool Grinder

Gallmeyer & Livingston Co., Grand Rapids, Mich., has announced a new Model 62 motor-driven power-feed universal cutter and tool grinder. The table of this machine is 6 inches wide by 42 inches long with a single 9/16-inch T-slot running its entire length. The machine will swing work up to 12 inches in diameter, takes pieces 28 inches long between work-head center and tailstock center, and has a longitudinal table movement of 24 inches.

Optional power feed provides for an infinite number of longitudinal table speeds from 4 to 100 inches per minute. A master handwheel provides three longitudinal table speeds of 1/2, 3 1/2, and 8 1/4 inches per revolution of the handwheel, which can be used at either the right or left side of the front of the machine.

Grand Rapids universal cutter and tool grinder announced by Gallmeyer & Livingston Co.

The vertical column is protected from grit and dirt by telescopic guards. If wear eventually occurs after years of service, it may be compensated for by means of a taper gib. The handwheel which actuates the vertical movement may be set at any point in a complete 360-degree arc. A portable motor-driven coolant system and a filtering type dust collector are optional equipment. 71

Brandes Wide-Bed Automatic Presses

The Brandes Press Co., Cleveland, Ohio, has placed on the market a new line of wide-bed automatic presses ranging in size from 30 to 2500 tons. One of these presses, of 175 tons capacity, is shown in the accompanying illustration. This press is built to Joint Industrial Conferences' standards, including T-slots in the top platen and complete remote control of the variable-speed drive. It has a die clearance of 28 inches, front to back, by 60 inches, right to left. The roll feeds have a 3-inch vertical adjustment, and will take material up to 18 inches in width. The scrap cutter has a 1-inch horizontal adjustment. Pitch adjustment of the roll feeds ranges from 0 to 12 inches.

The press illustrated has a maximum stroke of 10 inches. Speeds up to 250 strokes per minute are obtainable, depending, of course, on the length of the stroke. One outstanding feature of this press that is common to all machines of the line is that no moving parts or projections are built below the base of the press.

Reciprocating parts are counterbalanced by air cylinders, and incorporate long multiple V-guides in the base and long guides on the draw-rod. This gives an even pulling action to the top platen, increases die life, and assures high production speeds.

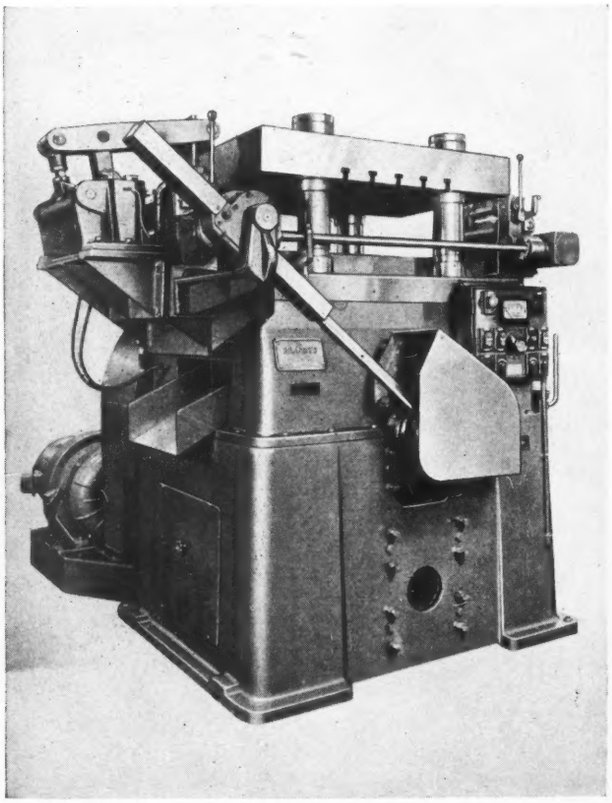
A remote push-button control panel gives the operator complete control of the press. The panel contains a master stop-button, electric tachometer, which is graduated in strokes per minute; inching button; run button; forward and reverse button for the electrical motor drive; and a manually operated rheostat for speed control. 72

Snyder Special Machine for Drilling and Chamfering Large Steel Ring

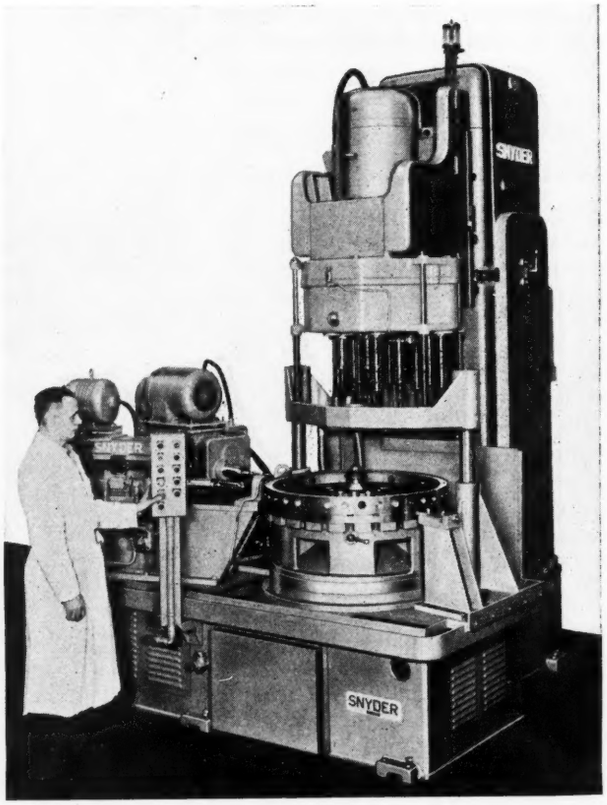
A machine that was designed for drilling and chamfering a 36-inch steel ring, 3 1/4 inches thick, but that can be readily adapted to similar operations, has just been developed by the Snyder Tool & Engineering Co., Detroit, Mich. This machine has a production rate of 1.6 pieces an hour, and is equipped with control mechanism that provides for alternating the depths of the thirty-six holes drilled and chamfered around the circumference of the work-piece.

The vertical head also drills three groups of holes in the top of the part. This head goes through an automatic cycle when the work-piece is located in the proper radial position. Automatic indexing of the 34-inch diameter table is accomplished by a Geneva mechanism. After the work has been clamped manually, the cycle is automatic, enabling the machine to be operated by semi-skilled help.

The vertical, eleven-spindle head is actuated by a 20-H.P. motor, and has a stroke of 16 inches. The



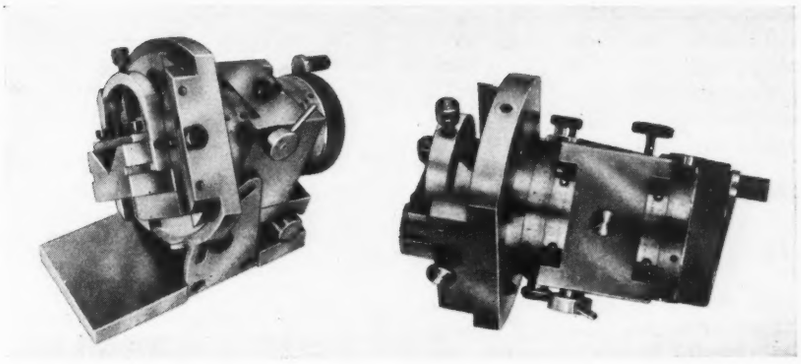
Wide-bed automatic press of new line announced by Brandes Press Co.



Snyder special machine for drilling and chamfering large steel rings

To obtain additional information on equipment described here, use Inquiry Card on page 229.

work cycle consists of the following sequence of operations: Load, rapid advance, drill, chamfer, rapid return, and index. This cycle is repeated until all radial holes are drilled. The fixture is mounted on a Snyder standard self-contained horizontal slide unit, which is driven by a 5-H.P. motor. Coolant is supplied from a 67-gallon tank, mounted on the rear of the machine, and is circulated by a 1/2-H.P. motor. Lubrication is automatic. The machine requires a floor space of 83 by 103 inches. ----------73



Eccentric and off-center grinding fixture announced by the Star Gauge Co.

Barber-Colman Hob Developed for Cutting Elliptical Gears

Special hobs like the one shown in Fig. 1 have been developed by the Barber-Colman Co., Rockford, Ill., to provide an efficient means of cutting elliptical gears such as shown in Fig. 2.

The number of leads or threads in the hob is equal to one-half the number of teeth in the gear, each lead cutting two diametrically opposite teeth. Since the teeth are designed from a base ellipse, rather than a base circle, even the involute curves on opposite sides of the same tooth are different. Thus each thread on the hob is unlike any of the other threads. With this new hob, eccentric gears can be cut from bar stock, eliminating the necessity of locating the hob with respect to the work. The true involute teeth of the hob are designed from a base ellipse developed to produce the best possible rolling action.

The unique feature of the elliptical gears is the constantly varying output speed obtained from a constant input speed. Both speed and power will vary, depending upon the eccentricity of the gears. Gears can also be designed that will produce quick return ratios to suit requirements. ----------74

Fig. 1. Barber-Colman elliptical gear hob developed for producing gears such as shown in Fig. 2

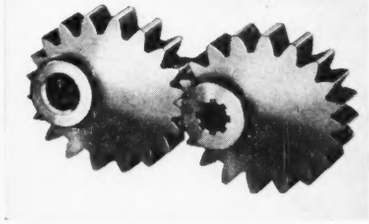


Fig. 2. Elliptical gears produced by a special hob of design shown in Fig. 1

"Starco Sine-A-Dex" Grinding Fixture

A new precision grinding fixture named the "Starco Sine-A-Dex" has just been announced by the Star Gauge Co., Springfield, Mass. This fixture is adapted for "one set-up" grinding of a wide range of eccentric and off-center work. A faceplate incorporating a V-block which can be set off center in two directions permits the grinding of rectangular punches requiring a radius at each corner and other similar work. Two setting rings with vernier graduations provide a rapid and accurate means of setting the fixture for grinding work to any included angle. These rings also permit positioning the included angle with any desired number of degrees at either side of a predetermined reference line.

The "Starco Sine-A-Dex" grinding fixture is hardened and ground throughout and can be used to advantage in grinding rounds, flats, indexed sections, splines, radii, groove slots, etc. It is light in weight, small in size, and can be easily converted to the use of draw collets. ----------75

Starrett Micrometer Depth Gages and Pocket Slide Caliper

The micrometer depth gage shown in Fig. 1 and the pocket slide caliper illustrated in Fig. 2 are new products of the L. S. Starrett Co., Athol, Mass. The micrometer depth gage is made with 2 1/2-, 3-, 4-, and 5-inch bases and in sizes ranging from 0 to 3 inches or from 0 to 6 inches. These gages have no-glare, rust-resistant satin chrome finish; a lock-nut to hold settings; a precision-ground micrometer screw with 1-inch move-

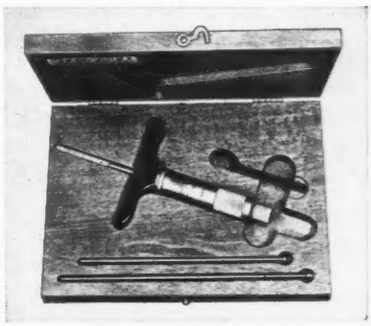


Fig. 1. Starrett micrometer depth gage

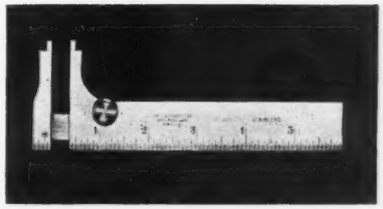


Fig. 2. Pocket slide caliper brought out by the L. S. Starrett Co.

ment; and graduations reading to 0.001 inch. They are designed for measuring the depth of holes, slots, projections, or recesses with true micrometer accuracy. Furnished in cases with extra measuring rods and adjusting spanner wrench.

The pocket slide caliper is a new larger size model having a capacity of 6 inches. It is rust-proof, being made of stainless steel, and has an improved clamping device. This model has a capacity for measuring outside dimensions up to 4 3/4 inches and inside dimensions from 1/4 inch to 5 inches. Separate precision machine-graduated scales on the slide provide for measuring to either 1/32 or 1/64 inch. The reverse side is graduated with a 6-inch scale reading to 1/32 inch. 76

Shakeproof Pre-Assembled Nuts and Lock-Washers

Shakeproof, Inc., Division of Illinois Tool Works, Chicago, Ill., has announced a new fastening device designated "Keps," which consists of a pre-assembled nut and lock-washer designed to make assembly operations easier and assure tighter, stronger connections wherever threaded nuts are employed. This new device has been developed as a companion product to "Sems," the pre-assembled screws and lock-washers originally introduced by Shakeproof, Inc., for use in industries employing large-scale mass assembly methods.

The new fastenings, assembled as shown in Figs. 1 and 2, extend

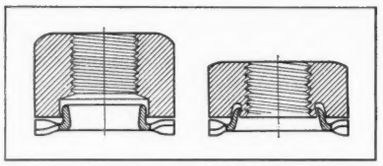


Fig. 2. Cross-section views of "Keps" shown in Fig. 1, illustrating assembly of nuts and lock-washers

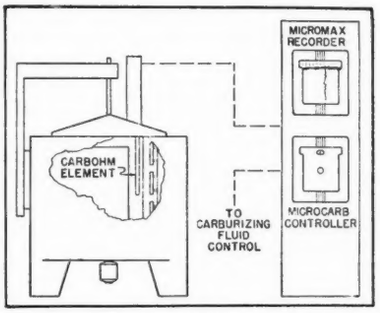
all the advantages of the principle of pre-assembly to nut and lock-washer applications, thus eliminating many costly hand operations. Other advantages include easier starting and driving, simplified ordering and stocking, and tighter fastening due to the fact that every nut is locked by a washer.

American Standard light nut type semi-finished hexagon "Keps" are available in five sizes, ranging from 1/4 to 1/2 inch in diameter, and American Standard machine screw nut type "Keps" are made in six sizes ranging from No. 6 to 1/4 inch in diameter. American Standard semi-finished hexagon regular nut type "Keps" are made in five sizes ranging from 1/4 to 1/2 inch in diameter. 77

Automatic Carbon-Content Control for "Homocarb" Carburizing Furnaces

A new development announced by the Leeds & Northrup Co., Philadelphia, Pa., makes it possible to measure and control the carbon potential of furnace atmosphere directly in terms of per cent carbon. By means of this "Microcarb" control, the surface carbon content of steel can be regulated as accurately as the temperature during heat-treating. The atmosphere can be adjusted to increase or decrease the carbon potential automatically, as required for surface carburizing, homogeneous carburizing, carbon restoration hardening, and annealing.

The principal feature of "the carbon-control system is a Carbohm" detecting element, which projects into the furnace work chamber like a thermocouple and



"Homocarb" carburizing furnace equipped with automatic carbon-content control

electrically "senses" the carburizing potential of the furnace atmosphere. Connected to this element is a "Microcarb" controller, which automatically adjusts the flow of carburizing fluid to hold the carbon potential of the furnace gas at any selected value between 0.15 and 1.15 per cent. For the heat-treater's guidance, a "Micromax" recorder draws a continuous record of the percentage of carbon as detected by the "Carbohm" element.

"Microcarb" control is supplied only for use with Leeds & Northrup "Homocarb" furnaces. It can be provided as an integral part of new equipment or it can be added to certain types of furnaces now in service. 78

Metron Combination Variable-Speed Units

The Metron Instrument Co., Denver, Colo., has made available integral combinations of its standard miniature variable- and fixed-ratio drives. These combination units are completely sealed and designed to retain the features of their individual components. For very low power applications requiring both speed

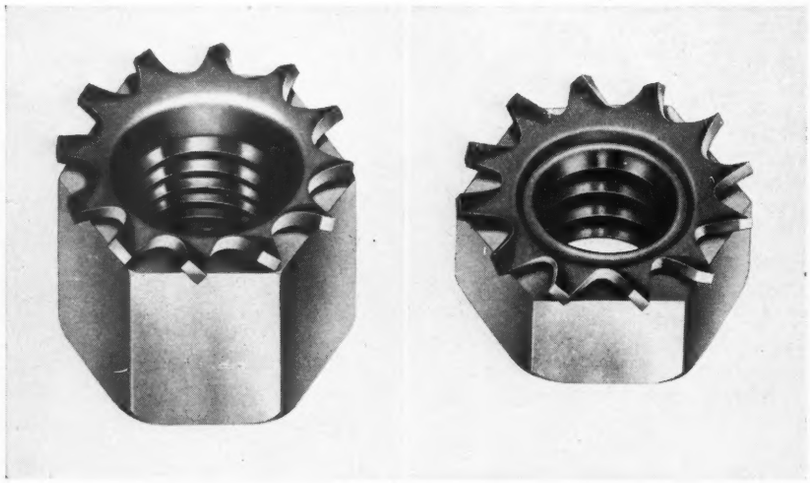
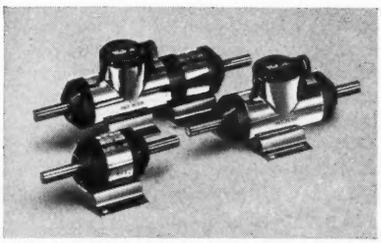


Fig. 1. (Left) American Standard light nut series "Keps" with external type Shakeproof lock-washer. (Right) "Keps" American Standard machine screw nut with assembled lock-washer

To obtain additional information on equipment described here, use Inquiry Card on page 229.

reduction and variable speed, these units deliver 2 pound-inches of torque. Applications include timers, recorders, controllers, computers, indicating mechanisms, and a wide range of similar motor-driven devices.

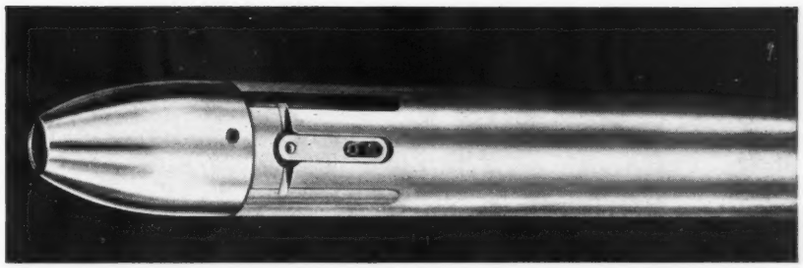
By combining the proper variable- and fixed-ratio units, a variable output speed of any desired nominal speed can be obtained that is infinitely adjustable from one-sixth to six times the nominal speed selected. For example, an 1800-R.P.M. motor coupled to a combination unit having a four-section, 531,441 to 1 reduction gear unit will give a variable output speed of 0.6 revolution to 20



Small combination variable-speed units brought out by Metron Instrument Co.

revolutions per day. Or, if a single-section, 2 to 1 reduction gear unit is used, all output speeds between 150 and 5400 R.P.M. are available.

Design features include ball-bearing shafts, permanent lubrication, and sealed construction. The fixed-ratio sections are available with extruded or hobbed gears and in a wide variety of standard ratios. ----------79



Air-gage plug for checking rough surface bores announced by Pratt & Whitney Co.

Pratt & Whitney Air-Gage Plug for Checking Rough Surface Bores

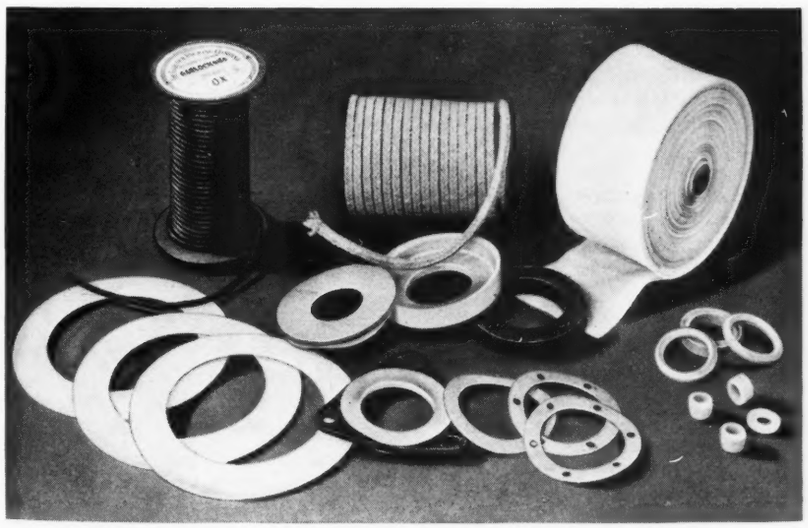
A contact gaging plug has recently been designed by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford, Conn., for its "Air-O-Limit" internal comparators, which permits gaging rough surface bores with a high degree of accuracy. The rate at which the air flows through the gaging plug is controlled by carbide buttons mounted on spring leaves. The buttons are depressed by contact with the work during gaging and impede the escape of air from small nozzles within the plug. Resultant change in line pressure causes the "Air-O-Limit" indicator to show the exact variation from basic diameter in decimal readings.

The contact plug is especially suited for gaging holes machined by diamond boring and reaming operations, where finishes exceed 50 micro-inches. This degree of roughness ordinarily prevents the use of conventional air-gage plugs in which the air jet is directed against the surface of the bore and the pressure is regulated only by the rate at which air escapes through the clearance space between the bore and plug. With this type of gage, a relatively smooth bore is necessary for accurate readings.

The contact gaging plugs can be furnished with either a bullet-shaped nose to permit easy entry or a pilot nose to provide for fast and accurate operation. The carbide buttons that contact the work can be easily adjusted for set-up or wear. The plugs can be obtained with chromium plate or carbide wear-resistant strips.----80

"Chemlon" Frictionless V-Ring Packing—Correction

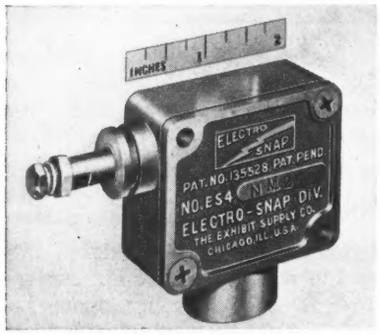
The new frictionless V-ring packing known as "Chemlon," brought out by the Crane Packing Co., Chicago, Ill., was erroneously referred to as "Schemlon" in November MACHINERY, page 220.



Garlock Packings and Gaskets Made of "Teflon"

Packings and gasketing materials fabricated by Garlock Packing Co., Palmyra, N. Y., from a tetrafluoroethylene resin developed by E. I. du Pont de Nemours & Co. under the trade name of "Teflon." These products are extremely inert to chemicals and are heat-resistant, tough, and durable. They have been developed to provide adequate seals for acids and chemicals of all kinds. Besides being unaffected by acids, they are highly resistant to all organic solvents and alkalies, operate at a temperature range from below minus 90 degrees F. up to 500 degrees F., and have high mechanical strength and a low coefficient of friction within that temperature range. Garlock braid-

ed and molded "Teflon" packings for use on valves, pump rods, or shafts and other equipment; gasketing for flange joints of all kinds; and envelope gaskets made of material encased in "Teflon" or gaskets made of solid "Teflon" are available in a wide range of sizes and shapes. 81

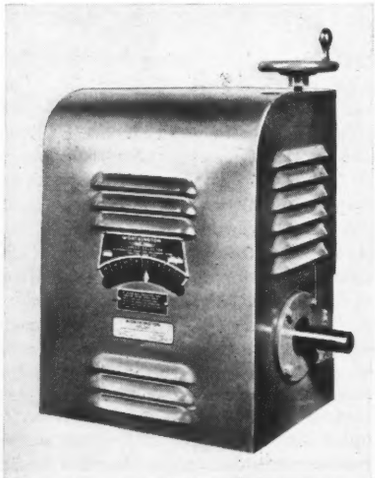


Electro-Snap Momentary Switch

New type of precision snap-action electrical switch with one-way "momentary action" announced by the Electro-Snap Switch Division of the Exhibit Supply Co., Chicago, Ill. Die-cast aluminum housing protects switch and provides simple mounting means with convenient access for wiring. The momentary feature is said to permit the use of simplified controls that frequently eliminate time delay relays, complicated actuating dogs and the need for additional switches. These units can be installed as control switches in a circuit so that contact is made either manually or mechanically as part of the operating sequence. 82

Worthington "Allspeed" Drive

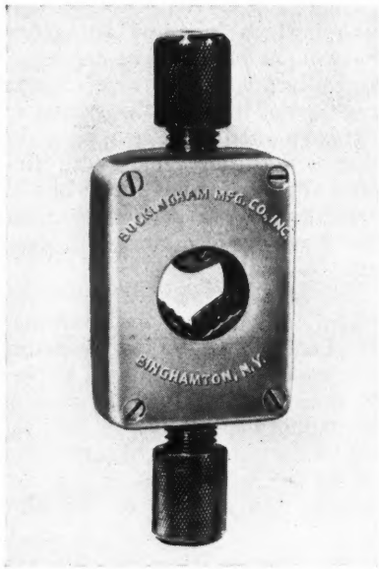
One of a new series of variable-speed transmissions designated the "Allspeed" drive, announced by Worthington Pump & Machinery Corporation, Paterson, N. J.



These new drives employ the Worthington tandem belt design, and are made in six models rated at 1, 3, 5, 7 1/2, 10, and 15 H.P., with speed ratios of 16 to 1, 10 to 1, 9 to 1, 8 to 1, and 6 to 1. At 1725 R.P.M. input, the 1-H.P. unit offers a range of 215 to 3450 R.P.M., while the 15-H.P. unit has a range of 370 to 2220 R.P.M. with an input speed of 1750 R.P.M. These drives are particularly suited to applications where space limitations require extreme compactness. They can be furnished for vertical or horizontal operation, and to run in either direction. Handwheel controls are normally furnished, but electrical remote controls can be supplied if required. 83

Buckingham Thread Restorer for Use in Close Quarters

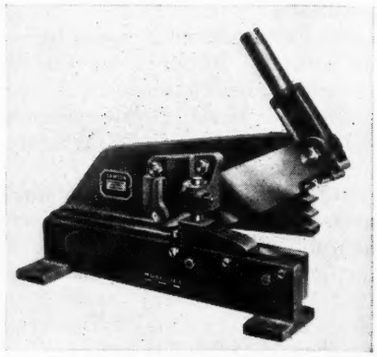
Thread restorer suited especially for reconditioning closely spaced studs and bolts that have become battered, distorted, or rusted. Recently added to



line of the Buckingham Mfg. Co., Inc., Binghamton, N. Y., to complete a range of sizes that includes all A.S.M.E. and S A E standard threads from 1/4 inch up to 4 inches in diameter. Having a swing of only 2 5/16 inches, the tool can be readily operated in close quarters. Especially adapted for renewing the threads on studs in cylinder heads of automotive, marine, Diesel, and steam engines. Adjustable cutting jaws permit fitting the tool to any right- or left-hand male thread of 1/4 to 1 inch root diameter. 84

Samson Hand-Lever Shears

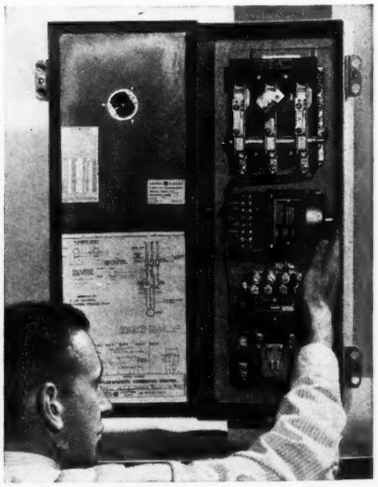
Hand-lever shears with unbreakable, offset, steel plate frame designed to enable the machine to cut sheet or plate of any length or width. These shears



are made in five models, the smallest having a capacity for cutting mild steel plate up to 1/8 inch thick, while the largest will cut mild steel plate up to 5/16 inch thick. Shears up to 3/16 inch capacity are operated by toggle action, whereas shears of 1/4 and 5/16 inch capacity have an extremely powerful geared action. All shears have hold-downs which are adjustable for the thickness of the material being cut. The machines will cut flats and rounds as well as sheet metal. Products of Julius Blum & Co., Inc., New York, N. Y. ..85

General Electric Combination Starter for Automotive Plants

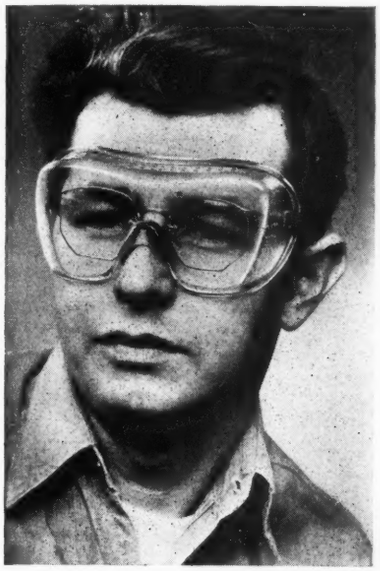
Combination starter announced by General Electric Co., Schenectady, N. Y. Available in both fusible and non-fusible types. Drip channel across the top and around the sides of the enclosure prevents liquids spilled on the case from entering. A machine tool type transformer with 230/460-115-volt multiple-rated primaries is included. Built-in single-volt circuit-breaker provides short-circuit protection. A self-contained terminal board facilities wiring. Up to four auxiliary interlocks for interconnecting circuits can be used. The interlocks can be changed from normally open to normally closed without adding parts. Also, circuits are color coded. 86



To obtain additional information on equipment described here, use Inquiry Card on page 229.

Impact Resisting Plastic Safety Goggle

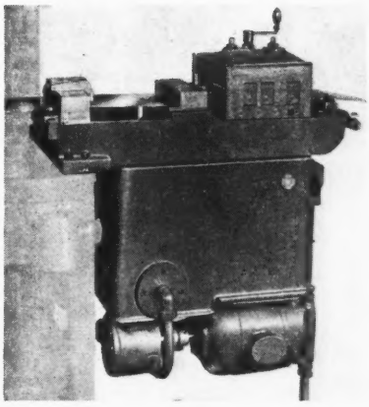
One-piece, optically correct safety goggle made of impact resisting plastic. Designed to afford exceptionally wide angle vision, fit all faces, and be worn over most standard types of glasses. Features include comfortable plastic nose-piece; perforations to minimize



fogging and provide adequate ventilation; and four-point contact with face by means of rolled edges designed for greater comfort. Weighs only one ounce. Recommended for protection against foreign particles striking from any direction when using various types of hand- and power-operated tools or machines. Announced by American Optical Co., Southbridge, Mass. 87

Haller Gripper Type Stock Feed

New Haller gripper type stock feed which can be used on practically any punch press. This Model 8 FTS stock



feed is hydraulically operated. It has a capacity for handling stock up to 8 inches wide and can be adjusted for any feed length up to 24 inches. The accuracy of feed is guaranteed within 0.003 inch to 0.005 inch on each stroke. The stock feed can be moved readily to other presses when desired. It is actuated from the press ram and has sufficient power to pull the stock through a roll type straightener, which is an integral part of the unit. Can be located to feed from the left, right, front, or back of press. Announced by Special Engineering Service, Inc., Detroit, Mich. 88

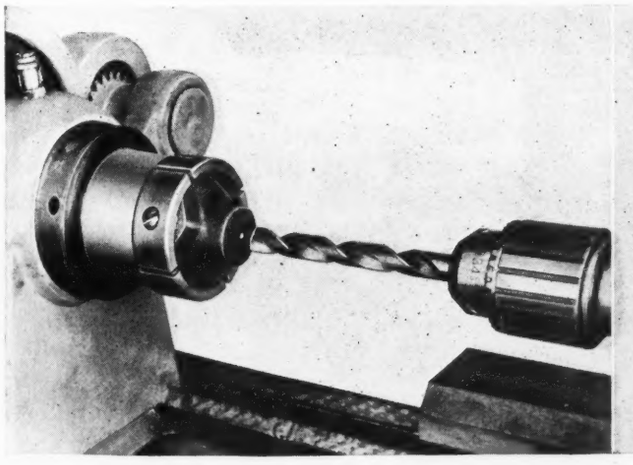
G-E Welder with Automatic "Hot Start" Control

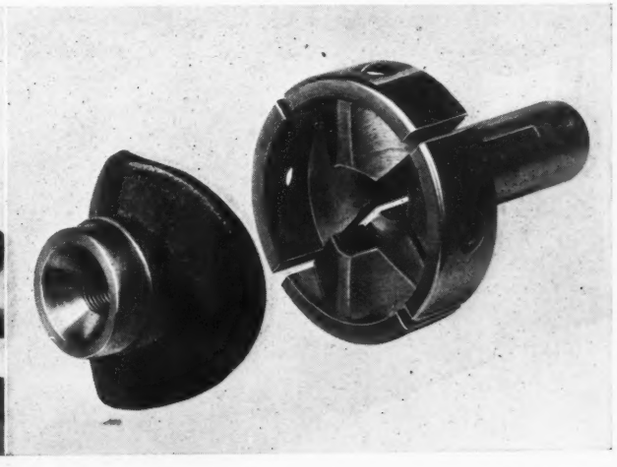
New silicone-insulated portable alternating-current welder equipped with automatic "Hot Start" control. Announced by the General Electric Co., Schenectady, N. Y. The silicone insulation gives a high margin of safety and operating dependability, since it is unaffected by high temperatures and is water-repellent. Instant arc striking without any manual adjustment is provided by the "Hot Start" automatic control. The correct amount of boost is always furnished for any specific

current setting. This welder has a current range of 40 to 375 amperes, uses electrodes from 3/32 to 1/4 inch in diameter, and can be employed for welding light or heavy materials. 89

Self-Centering Spring-Actuated Chuck

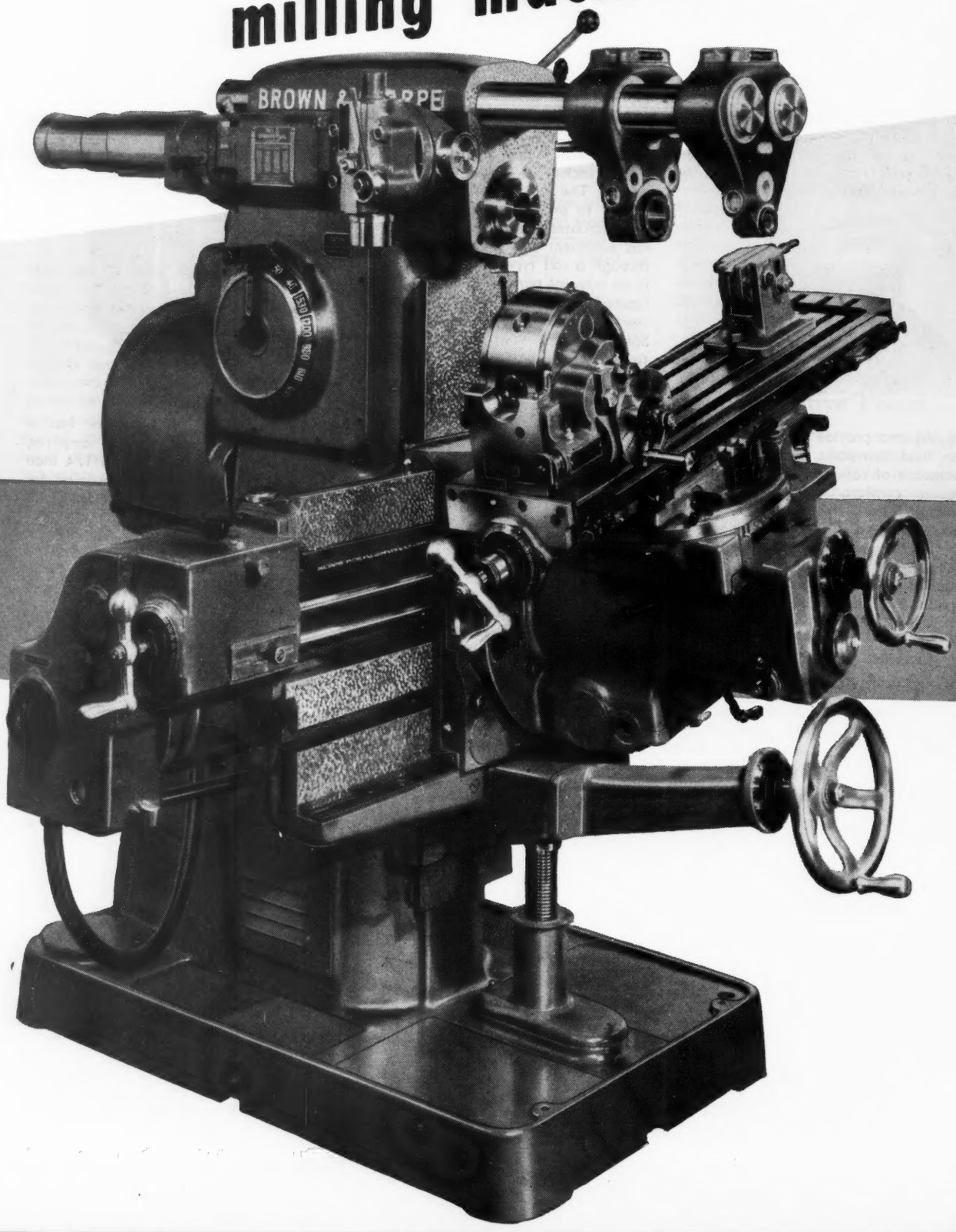
(Left) Self-centering spring chuck announced by the Self-Centering Spring Chuck Co., Bridgeport, Conn., shown mounted on a turret lathe. This new chuck is designed to speed up production by automatically centering work and eliminating need for clamping or changing adjustments. Permits irregular-shaped pieces, such as shown in view at right, to be drilled, tapped, countersunk, reamed, counterbored, or faced at high production speeds on lathes and screw machines. A light finger pressure will seat the work in the chuck. The four spring-actuated chuck jaws automatically grip and center the work. Available in capacities from 1/2 inch to 8 inches. 90

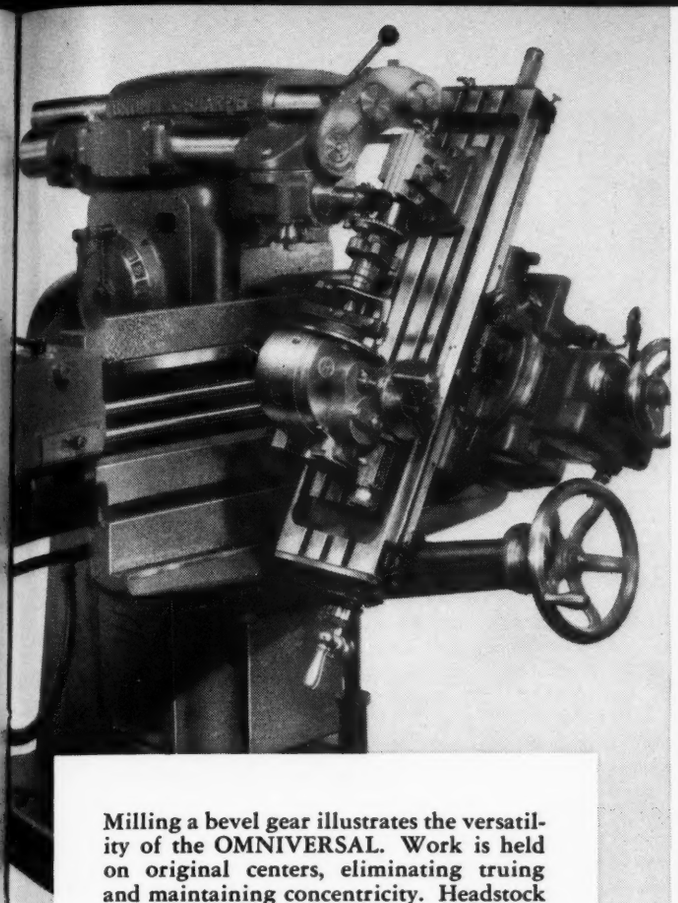




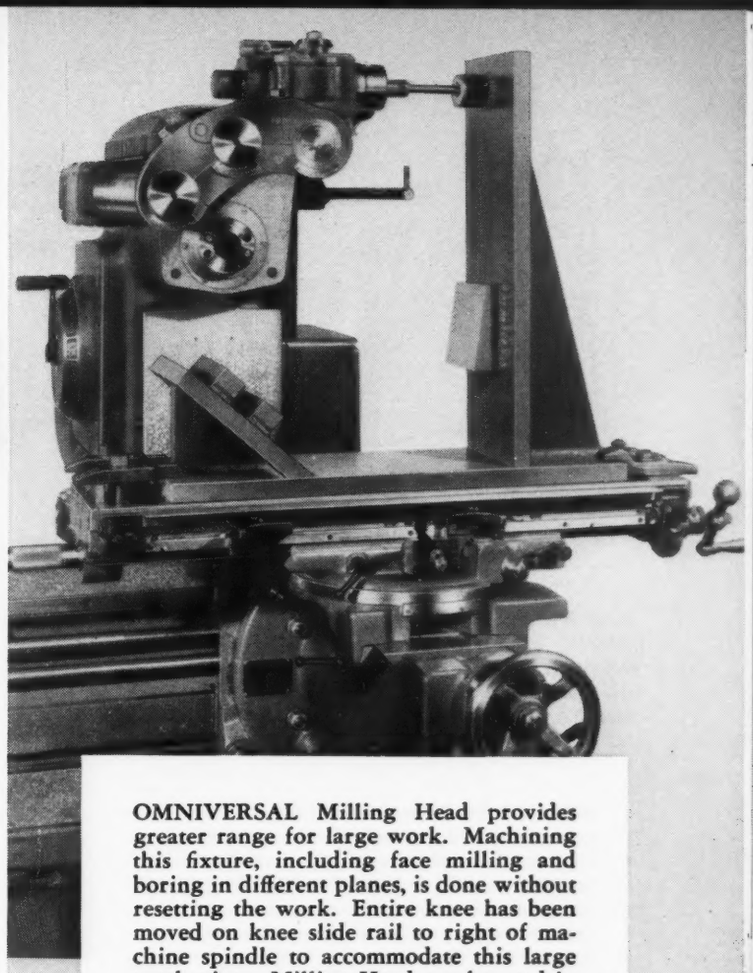
ANNOUNCING

The New OMNIVERSAL milling machine





Milling a bevel gear illustrates the versatility of the OMNIVERSAL. Work is held on original centers, eliminating truing and maintaining concentricity. Headstock and footstock provide greater support and save time. Knee is readily swiveled to 60° either side of horizontal. The vernier on knee reading to 2 minutes of arc assures greater accuracy.



OMNIVERSAL Milling Head provides greater range for large work. Machining this fixture, including face milling and boring in different planes, is done without resetting the work. Entire knee has been moved on knee slide rail to right of machine spindle to accommodate this large work piece. Milling Head can be used in three column positions further increasing the machine's versatility.

Brown & Sharpe

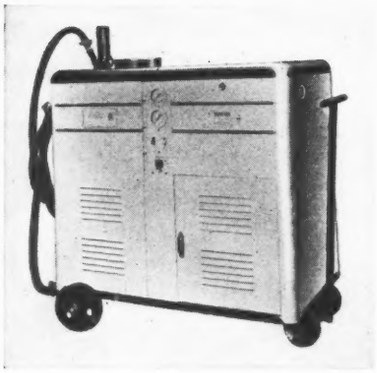
...the milling machine with unparalleled versatility!

This is it — the ultimate in milling machine versatility! The new Brown & Sharpe No. 0 Omniversal Milling Machine performs a wide variety of work without the need for attachments, jigs, or fixtures. Ideal for toolrooms, experimental and research laboratories, — also repair shops and small-quantity production plants.

For all normal milling operations and the unusual applications demanding highest precision, there is no substitute for the OMNIVERSAL. Ability to mill simple or compound angular surfaces or to drill and bore at angular settings permits complete machining without resetting work on table. Milling tapered work on Index Centers no longer requires swiveling head and footstock or special fixtures. Taper spirals are readily milled.

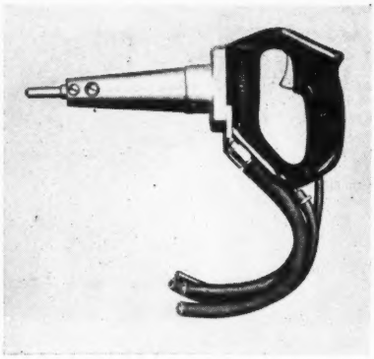
The result is greater accuracy with a saving in both set-up and machining time.

Get the complete story on this outstanding machine. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.



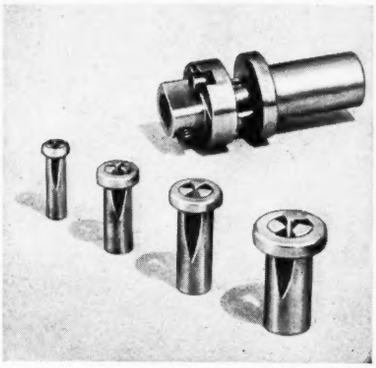
Improved Heavy-Duty Vapor Steam Cleaner

Improved heavy-duty type vapor steam cleaning machine for general industrial, automotive, railroad, aviation, and other uses. Announced by the General Equipment Division, Sterod Mfg. Co., Newark, N. J. The fully automatic system of this cleaner is said to permit one-man operation while at the same time accelerating the cleaning process. The snap of a switch generates a spark, which ignites the burner and places the machine in operation. From this point on, fully automatic controls maintain the operation at its peak. This machine is now available in stationary or portable models of 100 or 200 gallons maximum capacity. 91



Ripley Rivet Gun for Explosive Rivets

Rivet gun using du Pont explosive rivets for high-speed operation in blind holes and "hard to get at" spots. Recently announced by Ripley Co., Inc., Middletown, Conn. This gun eliminates the need for a back-up, hammer, or bucking bar. Only a single touch of the gun (less than two seconds) is required to set the rivet. Light enough to permit easy handling by women workers. The tips are made of Nichrome steel welded to a bronze base. The two-piece handle of molded plastic has a handy "off-on" switch designed for easy manipulation on heavy production work. Especially adapted for use on maintenance or repair work. 92



Woodruff & Stokes Small Prong Dies

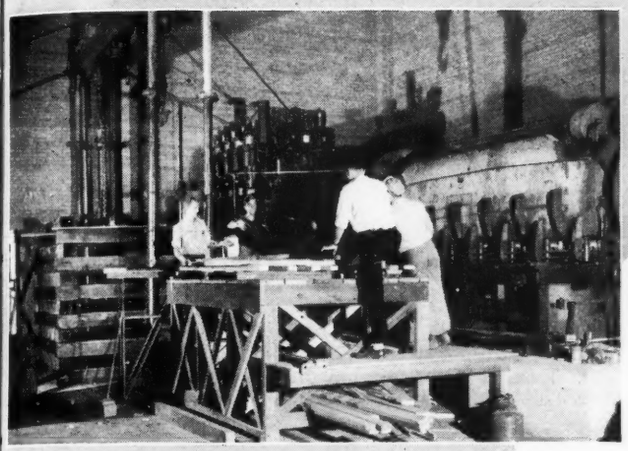
New line of small prong dies recently introduced by Woodruff & Stokes Co., Quincy, Mass. These dies were designed to produce more uniform and smoother precision threads. Said to make possible much longer production runs before resharpening becomes necessary. They are made with 36 to 360 threads per inch, in diameters of 0.250 to 0.016 inch. With these dies, tolerances can be held to ± 0.0002 inch. All dies have lapped threads. The standard sizes are available in either high-speed, carbon, or special alloy steel. Adapted for use on B & S automatic and Swiss type machines, as well as for hand operations. 93

Sheffield Gaging and Segregating Machine

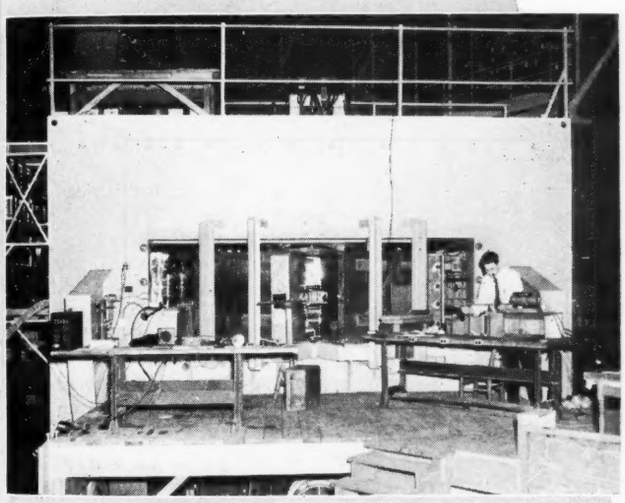
New type of automatic gaging and segregating machine for dimensional and load checking of ceramic protector blocks having carbon inserts, used in telephone equipment. This machine is designed for rapid change-over and set-up on several different blocks, and will check up to 3600 parts per hour. The protector blocks are loaded manually into a magazine type feed and a blast of air cleans the parts as they move down the chute. A signal-light panel gives visual indication of results of each gaging operation. Rejected parts are segregated into maximum and minimum chutes. Parts passing all gaging stations are indexed to a chute which carries them on an endless belt conveyor outside the machine. When fewer than the required number of parts are loaded, the machine stops automatically, thus preventing it from indexing while a part is entering the carrier. The machine is made by the Sheffield Corporation, Dayton, Ohio. 94

To obtain additional information on equipment described here, use Inquiry Card on page 229.

a cincinnati shear helps build the biggest betatron in the world



Cincinnati 10014 Series Special Shear cutting laminations for the Betatron.



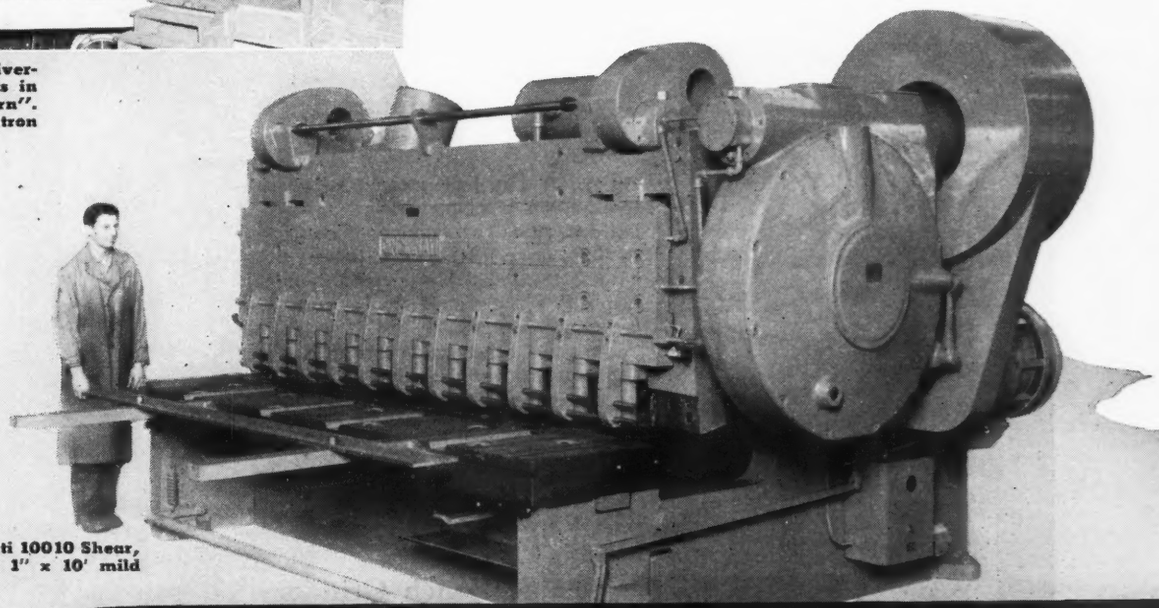
Betatron was built by University of Illinois physicists in sunken "Betatron Barn". Flux magnet of Betatron weighs 275 tons.

University of Illinois builds powerful radiation machine to split atoms.

Betatron produces 300 million volts, speeds up electrons to 186,000 miles per second. First job for this Betatron (world's biggest atom smasher) is the study of the mysterious sub-atomic mesons.

A Cincinnati Shear cut the laminations for this spectacular machine. Other Cincinnati Shears also are widely used by electrical manufacturers for shearing lamination stock accurately and without burrs. Knife life is unusually long on a Cincinnati even on this abrasive material.

Write for Catalog S-5 on Cincinnati All-Steel Shears, the shears of accuracy.



Cincinnati 10010 Shear, capacity 1" x 10' mild steel.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A.

SHAPERS · SHEARS · BRAKES

CINCINNATI

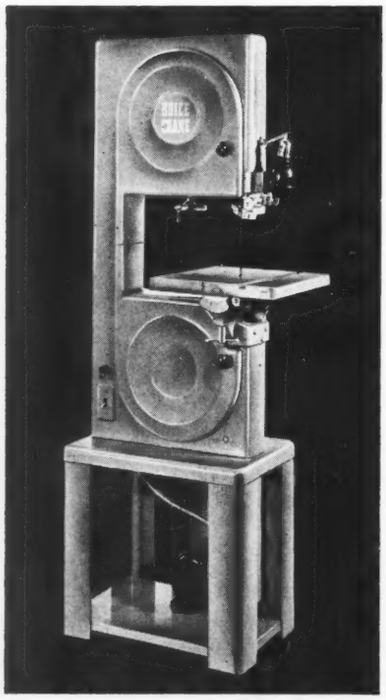
Light Intensifier for Electric Light Bulb

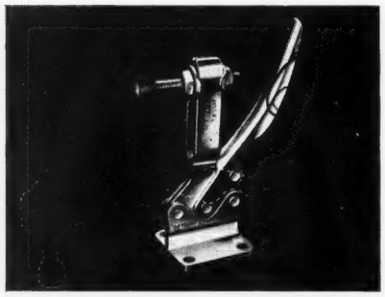
Light intensifier consisting of lens and holder for attaching to electric light bulb. A light bulb with this intensifier attachment is said to give three times as much light on a given spot than is available without the attachment. The

intensifier is simply adjusted or turned in the direction in which more light is desired. It is easily assembled by inserting two wire springs in the band of the device. Introduced by Light Intensifier Co., Detroit, Mich. 95

Boice-Crane Band Saw with Open Type Floor Stand

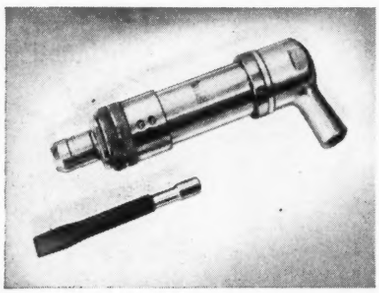
New model band saw mounted on individual open type floor stand, just developed by the Boice-Crane Co., Toledo, Ohio. The addition of this model increases to twelve the total number of 14-inch band saws in the Boice-Crane line. 96





"De-Sta-Co" Toggle Clamp

Compact, quick-acting toggle clamp for use on production work-holding fixtures, added to "De-Sta-Co" line of toggle clamps manufactured by the Detroit Stamping Co., Detroit, Mich. This new No. 235-U clamp provides holding pressures up to 650 pounds. Clamping bar moves into a fully retracted vertical position when the clamp is opened, allowing maximum clearance for speedy insertion and removal of work. The rubber-tipped bolt assembly is adjustable both horizontally and vertically. Dimensions when closed are 2 3/4 inches high by 10 1/4 inches long; when open, the height is 6 1/4 inches. Weight is 1 1/4 pounds. 97

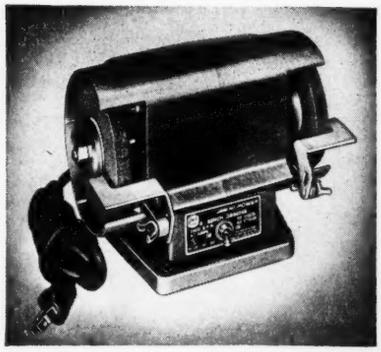


Appleton Pneumatic Hammers

Air-operated tool of exceptional power for drilling, chipping, trimming, riveting, and general applications, announced by the Burgess Thomas Co., Bloomfield, N. J. This small size pneumatic hammer is 9 1/2 inches in length, and has a piston diameter of 1 inch. Its unique "no-trigger" construction combined with light weight (approximately 5 pounds) contributes to safe, easy handling. The hammer operates without recoil when pressed into contact with the work, and stops when withdrawn. The force of the blow can be easily controlled or adjusted. 98

Portable Bench Grinder

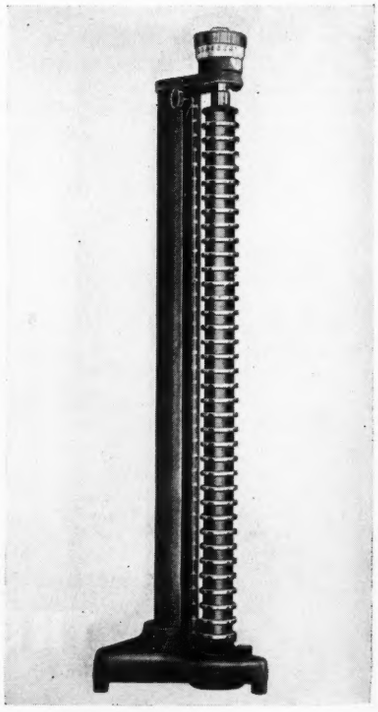
Compact, streamline, portable bench grinder adapted for tool and cutter sharpening jobs. Known as Model 400 "Hi-Power" bench grinder. Features include powerful, fan-cooled, 110- to 120-volt, single-phase, 60-cycle, 3500-R.P.M. motor with precision, dynamically balanced rotor; two adjustable toolrests; "on-off" toggle switch built into front of motor housing; and lightweight, die-cast motor housing with integral wheel guards and base with rubber feet. Supplied with two balanced vitrified grinding wheels, 4 inches in



diameter by 1/2 inch face (one fine and one coarse). Announced by Portable Electric Tools, Inc., Chicago, Ill. 99

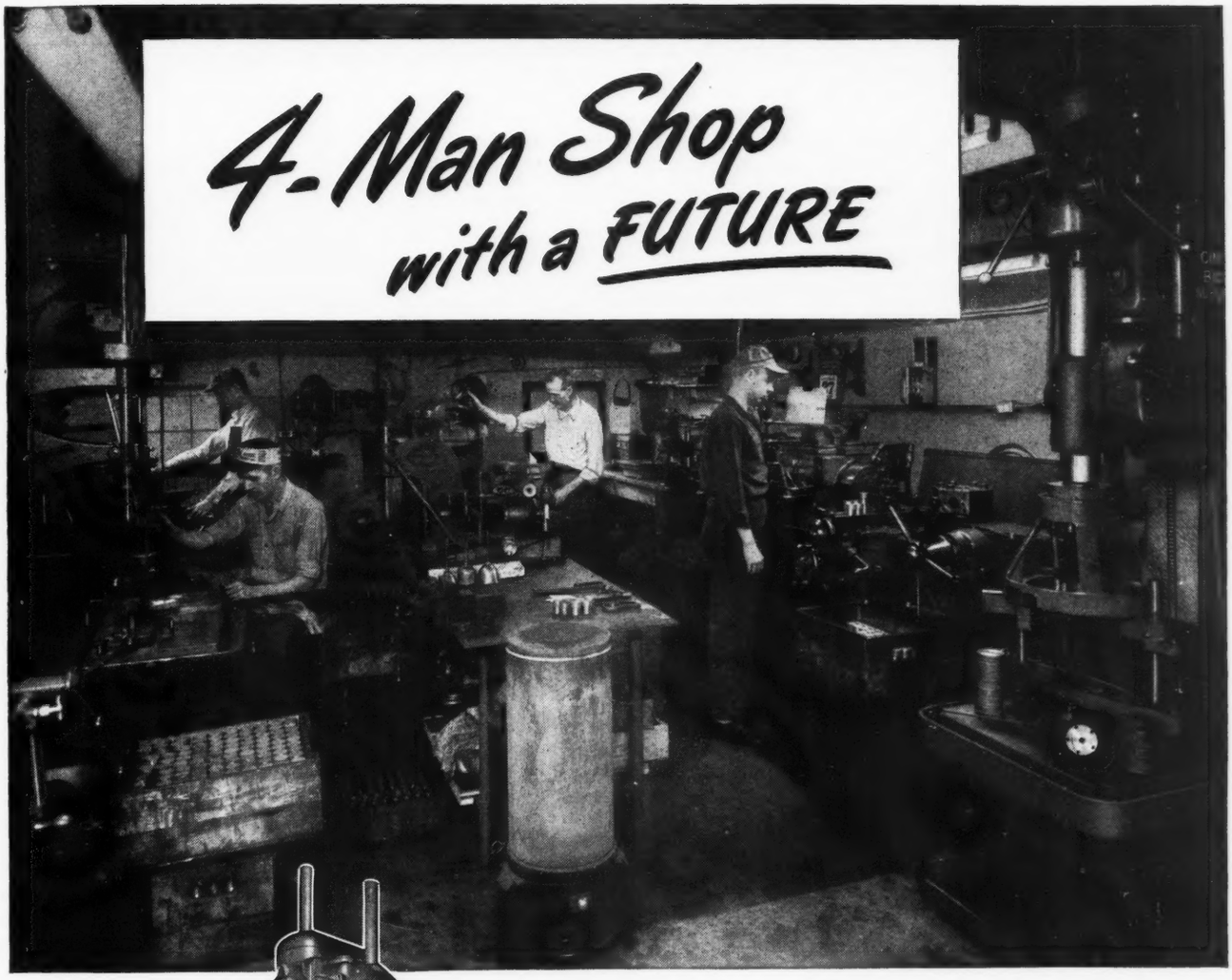
Larger Gage Added to Pla-Chek Line

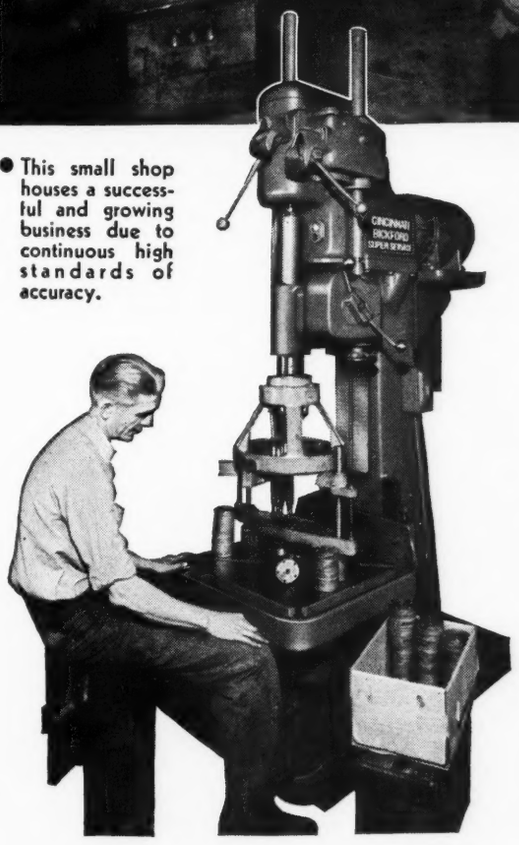
New 36-inch height gage for surface plate work recently added to "Pla-Chek" line manufactured by the Cadillac Gage Co., Detroit, Mich. This gage is made from a hardened steel bar that contains thirty-six steps, spaced exactly 1 inch apart. A micrometer screw thread is ground on the lower end and a large micrometer thimble above is graduated to 0.0001 inch. In checking work on the surface plate, the micrometer



To obtain additional information on equipment described here, use Inquiry Card on page 229.

4-Man Shop with a FUTURE





● This small shop houses a successful and growing business due to continuous high standards of accuracy.

Quality equipment pays the small operator as well as the large.

The Schoening Machine Service, 3284 Dunn Street, Cincinnati, Ohio—business, production machining—small in size—big in accomplishment—testifies to the value of fine tools.

The Cincinnati Bickford Super Service Upright Drill, illustrated, is drilling five $\frac{11}{32}$″ holes and four $\frac{11}{32}$″ holes to a plus or minus .005″ tolerance in a steel cover $\frac{5}{16}$″ thick—a production job.

Mr. Schoening tells us he has held accuracy to a plus or minus .0002″ on production reaming jobs.

Write for Bulletin No. U-25.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Radials 7½″ dia. col., 2½′ arm, to 26″ dia. col., 12′ arm.
General purpose Uprights, 21″ to 28″ sizes.
Production Uprights, 21″ to 28″.
Jig Borers, Portable Horizontals, Spacing Table Machines.

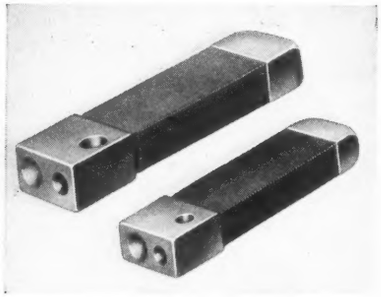
Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio, U. S. A.

thimble is set at zero, after which the micrometer is set for the desired dimension in thousandths and ten-thousandths of an inch. The measurement is taken from the desired inch step. Measurements are accurate to 0.0002 inch within the 36-inch range. 100

Cunningham Safety Rivet Sets

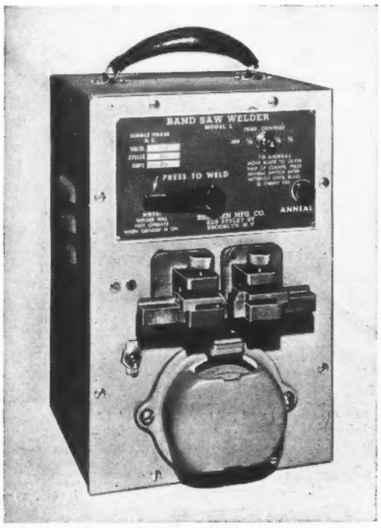
Two safety steel rivet sets of new line announced by M. E. Cunningham Co., Pittsburgh, Pa. Made from this company's special "Mecco" safety steel to prevent spalling, mushrooming, and injury to personnel. These sets will be made in five standard sizes for 1/8- to 9/32-inch rivets. Two shank designs



are available—the patented wedge grip design, providing a knurled grip, and the standard straight-shank type...101

Brennen Portable Band-Saw Blade Welder

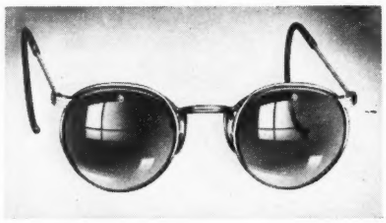
Portable, low-cost band-saw blade welder available from Brennen Mfg. Co., Brooklyn, N. Y. This welder handles the new 0.050-inch diameter contour-cutting band-saw blades as well as regular types up to the 1/2-inch size. The wide range of this welder makes it particularly useful in welding blades for internal tool and die work.



The welder is fully automatic and has a built-in grinder, designed to remove flash from the weld. It is also equipped with a gage for checking the thickness of the weld on flat saws. Housed in a welded steel case 7 3/4 by 12 by 7 inches. 102

Light-Weight Safety Goggle

Metal safety goggle featuring light-weight, easy adjustment, and stronger construction, announced by American Optical Co., Southbridge, Mass. Designed to provide eye protection from



flying particles. This new F4100 "Ful-Vue" metal goggle has temples which are perspiration-proof and have insulating tubes over the ear portions. Supplied in three standard eye sizes and five standard bridge sizes. Obtainable with Super Armorplate clear or Calobar lenses. Goggles can also be fitted with Super Armorplate lenses ground to the user's own prescription. 103

General Electric Long-Scale Switchboard Instruments

One of a new line of 8 3/4-inch, long-scale switchboard instruments designed primarily for applications where long-range readings must be taken. Announced by General Electric Co., Schenectady, N. Y. Made in types designated AB-16 (alternating current) and DB-16 (direct current). The new instruments are made with 250-degree scales 14.2 inches long for legibility. The scale is mounted flush with the front of the case. 104

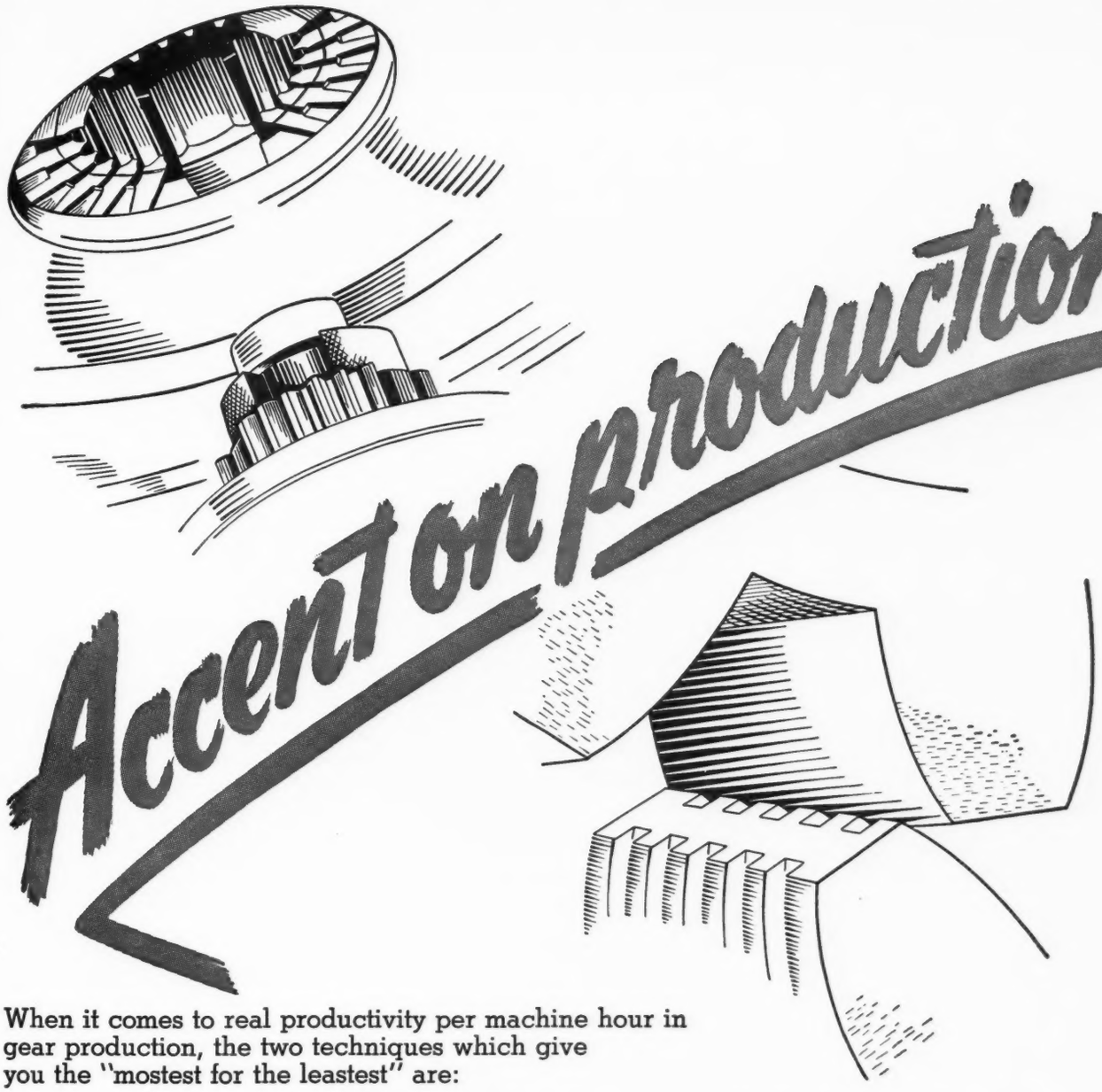
Air-Operated Power Chuck

Air-operated, scroll type power chuck with universal adjustment for pipe size. This self-contained chuck has a cam-actuated gripping action and can be actuated without stopping the machine arbor. Only a small quantity of low-pressure air is required to operate the chuck. Developed by the Bignall & Keeler Division of the John Ramming Machine Co., St. Louis, Mo., for use on this company's line of pipe-threading machines. 105

Dial Indicator for Precision Checking

Geneva dial indicator with exact lever movement reading to 0.0001 inch for precision checking of variations in contour, dimensions, or roundness. Manufactured by the Chicago Dial Indicator Co., Chicago, Ill. This instrument is designed for precise indicating on a wide range of machining, lay-out, checking, and inspection work. Geneva dial indicators of this type graduated to 0.0005 and 0.001 inch are also available. All have an adjustable metal dial with positive internal lock for fine settings and clear graduations. They are 2 inches in diameter, with a 1/2-inch thick case. 106

To obtain additional information on equipment described here, use Inquiry Card on page 229.



When it comes to real productivity per machine hour in gear production, the two techniques which give you the "mostest for the leastest" are:

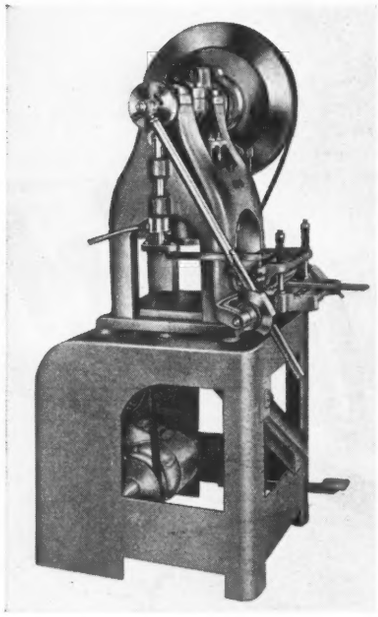
1 Shear-Speed gear cutting. In which all teeth are cut simultaneously in a fraction of the time required by other cutting methods. Applicable to internal and external spur gears and splines (involute and other shapes)—also to other toothed-form parts, regular or irregular. (Some helicals, also, but not all.)

2 Underpass gear-finishing in which a single "pass" of the cutter forward and back finishes a gear to the highest precision. (For very wide gears, traverpass or transverse shaving can be used on the SAME MACHINE—if it's a "Michigan".) Underpass shaving is available for spur and helical gears and splines from ¼ in. to many feet in diameter.

To produce more gears per hour "for less"—in mass production or job lots—you can't beat a "Michigan-tooled" line.

COMPLETE from blank to finished gear EQUIPMENT

MICHIGAN TOOL COMPANY 7171 E. McNichols Road Detroit 12, U.S.A.

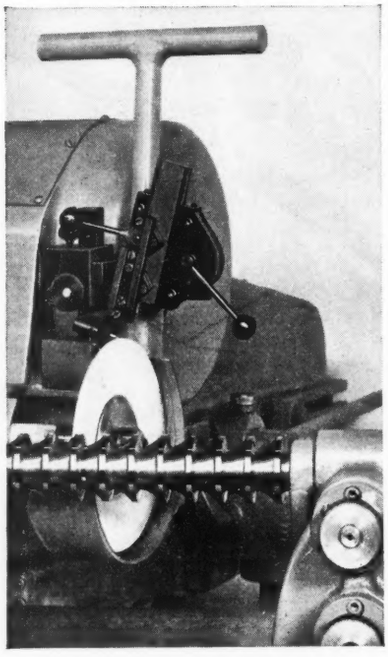


Diebel High-Speed Automatic Press

High-speed 8-ton automatic press recently added to the line of 5- and 12-ton models made by Di Machine Corporation, Chicago, Ill. This press is similar in design to the preceding models. The cylinder type ram, which slides in an adjustable bronze sleeve, insures greater accuracy and longer life. A variable-speed drive permits selection of any speed from 110 to 350 strokes per minute. A rugged, precision, built-in roll feed of either single or double construction facilitates setting and helps maintain a high degree of accuracy. The maximum die set capacity is 6 inches wide, 8 inches long, and 6 inches shut height. 107

Dymon-ize Dressers for Broach Grinding Wheels

"Dymon-ize" grinding wheel dressing attachment designed for use on broach sharpening machines. This unit was developed by the Colonial Broach Co., Detroit, Mich., to permit grinding new broaches to a finer finish in the company's own plant, and is now placed on the market. The linkage that controls the arc of travel of the diamond point permits dressing the wheel to any radius up to 5/16 inch by a single adjustment. The unit has two control handles, one for dressing radii and one for dressing the side of the wheel tangent to the radius. 108



New Resilient Gears Make Possible More Powerful Electric Locomotives

Advances in the development of resilient gears for traction drives, said to be of great importance in the future of electric locomotive design, are discussed in an article in the current issue of *Rubber Developments*, a quarterly publication of the British Rubber Development Board. The article, dealing with recent engineering developments in rubber, describes a new type of shock-absorbing gear that has made possible the construction of the most powerful locomotives ever built for a 3-foot 6-inch gage railway. Other developments discussed in this article include new uses of rubber in motor vehicles—for chassis suspension systems, flexible engine mountings, bearing and spring assemblies—and in ships and mechanical handling equipment.

Copies of this issue of *Rubber Developments* are available free of charge from the Natural Rubber Bureau, Dept. S-50, 1631 K St., N.W., Washington, D. C.

* * *

The importance of the automotive industry to the economy of our country is reflected in the recent United States Census of Business, which showed that slightly over 20 per cent of total retail sales in 1948 were made by automotive establishments, including gasoline filling stations.

Prize Contest for Papers on Resistance Welding

The Resistance Welder Manufacturers Association has announced the 1950-1951 prize contest for original papers on resistance welding. The contest ends on July 31, 1951. Applicants' papers may be devoted to redesign or improvement of present design, research, or new applications of resistance welding.

A total of $2250 will be paid in cash awards. Three prizes—$750, $500, and $250—will be awarded for the best papers from an industrial source, consulting engineer, or private or governmental laboratories; two prizes—$300 and $200—will be awarded for papers emanating from a university source—either an instructor, graduate student, or research fellow; and $250 will be given for the best paper received from an undergraduate student. The awards will be made at the 1951 fall meeting of the Society.

Papers entered in this contest should be mailed to the American Welding Society, 33 W. 39th St., New York 18, N. Y.

* * *

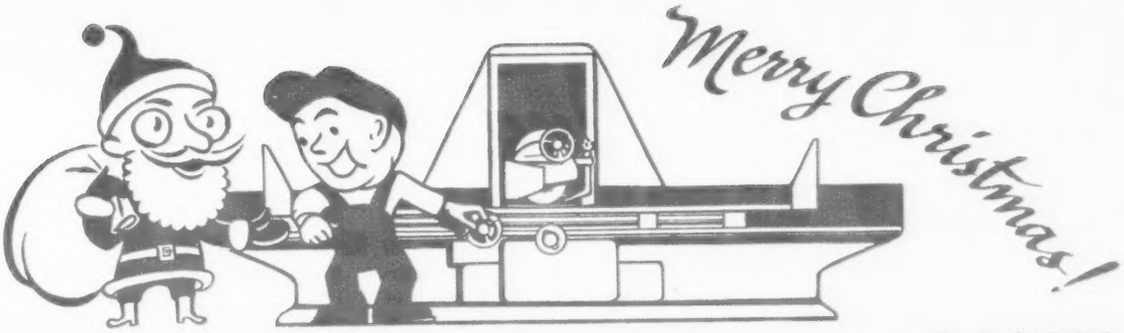
SKF to Install Bearings on Thailand Engines

Installation of spherical roller-bearing journal units on forty-five Diesel-electric locomotives for the Thailand Royal State Railways will be made by SKF Industries, Inc. The locomotives, which will be built by Davenport-Besler Corporation, of Davenport, La., will require 420 journal boxes and 840 spherical bearings. Thirty of the locomotives are 78-ton 4-4-0 units incorporating two 500-H.P. motors. The remainder are 53-ton 0-6-6-0 units with one 500-H.P. motor. They will have a maximum speed of about 43 1/2 miles per hour.

* * *

A 16-millimeter motion picture film showing the making of high quality copper alloys has recently been produced. It shows the production of phosphor-bronze, nickel-silver, cupro-nickel, and beryllium-copper alloys, from the casting through inspection and shipping. Copies for showings can be obtained from the Riverside Metal Co., Riverside, N. J.

To obtain additional information on equipment described here, use Inquiry Card on page 229.



By E. S. Salichs

BETWEEN GRINDS

Yule for You All

Here's to your very Merry Christmas and most Happy New Year! Since we can't toast you in punch, we'll do it in print. At this point we always come in with a happy birthday wish to ourselves—Between Grinds is now all of three years old, and we celebrate with a renewed wish that our readers have patience with puns, for we are apt to slip on the quip.

It Isn't Anything, Really

Two evenings a week the Specialties, Inc., plant out in Syosset, Long Island, is open to employe-hobbyists who may use any equipment that they are qualified to operate. Hobbyists supply their own material and agree not to offer their output for sale. Looks as though everybody will be whipping up Christmas gifts except the poor chap who operates a drill press—just what can you make full of holes that somebody will want under the tree?

To Relish or Embellish?

A Canadian outfit wrote to us for the "name of a firm which manufactures machinery to make spaghetti and macaroni." What surprised us was the name of the inquirer: Western Ornaments. Upon speculation, we figured out that perhaps the concern manufactures jewelry out of these farinaceous products (not so far-fetched—youngsters string up the stuff). Then if you're lost out in the Great Northwest, you can remove your squaw's necklace, flatten it out on the rocks and bake a hot pizza.

Bell-Ringing

MACHINERY starts the New Year with a bang-up special issue —Rearmament the subject. It will cover the latest developments in ordnance manufacture, words and pictures (we mention that we supply the words because the pictures will leave you speechless). Our Editor has been in and out of the Pentagon Washington way to consult with the Ordnance Corps, who gave MACHINERY an enthusiastic nod which opened wide the gates of specified plants. Believe us, the January number is so charged with electrifying material that it is being sent out in asbestos lined envelopes.

The Brain Goes to College

Any student at the Stevens Institute of Technology who refers to himself as The Brain, now has some really stiff competition to face—in the form of the analogue computer. Recently lent to the Institute by the Office of Naval Research, the mechanical brain will be used for research computations and for instruction in connection with a graduate course in computing devices.

Andrewsen in Action

The October editorial "Machine Tools Supplied Russia of No Military Value?" brought letters of approbation to the Editor's desk. A. C. Andrewsen of Grosse Pointe Woods, Mich., even asked permission (granted) to have copies of the editorial made which he intends to send to Congressmen, newspaper editors, ministers, and his acquaintances.

R. F. V. STANTON, vice-president in charge of manufacturing at the American Machine & Foundry Co., Brooklyn, and author of the leading article in this issue of MACHINERY, was born in Boston and brought up in Montpelier, Vt., where he started as draftsman with the Lane Mfg. Co. Soon switched, however, to the Pratt & Whitney Co., Hartford, Conn., as supervisor of gage design. Then he enlisted with World War I marines; in 1919, returned to P & W as production engineer, a responsible position for one just turned twenty-one.

In 1926, he became manager of the company's machine tool division. Continuing through various assignments, he was made assistant general sales manager in 1945, and two years later a vice-president. Mr. Stanton's present association with A M & F began in 1948. He is most active in professional engineering associations. Mr. Stanton resides in Hartford and is well versed in the mechanics of living, for two grown sons and a teen-age daughter are mainsprings of "know-how."

News of the Industry

California

DORAN H. BECKWITH, for the last four years sales manager of the Quijada Tool Co., Inc., Los Angeles, Calif., manufacturer of pipe threading and cutting tools, has returned to active duty with the Army, and is succeeded by ROLAND V. DICKENSON.

JACK S. MORGAN has been appointed assistant to the works manager of the Western Gear Works, Lynwood, Calif. He was previously assistant works manager and general superintendent of the National Supply Co., Torrance, Calif.

RONALD C. HINMAN has been appointed sales engineer with the Western Gear Works, Lynwood, Calif. He has been assigned to the aircraft industry activities.

Colorado and Texas

ARMSTRONG EQUIPMENT SUPPLY CO., INC., 1314 Wazee St., Denver, Colo., has been appointed industrial sales agent in Colorado for the BERGER MANUFACTURING DIVISION of the REPUBLIC STEEL CORPORATION, Cleveland, Ohio, manufacturer of steel shelving, automotive equipment, steel office equipment, etc.

DR. TRACY C. JARRETT has been appointed representative for the "Certain Curtain" line of heat-treating furnaces and allied equipment manufactured by C. I. HAYES, INC., Providence, R. I. Dr. Jarrett's headquarters will be at Denver, Colo.

JOHN A. MAXWELL, JR., administrative assistant to the president of the Texas Engineering & Mfg. Co., Inc., Dallas, Tex., has been promoted to the post of works manager, and OTTO WITBECK, formerly general superintendent of the company, has been made factory manager.

Illinois and Indiana

WILLIAM F. PIOCH has been appointed manager of manufacturing engineering of the newly formed Aircraft Engine Division of the Ford Motor Co., with headquarters in Chicago, Ill. The new division will produce Pratt & Whitney twenty-eight-cylinder engines for B-36 bombers. Mr. Pioch, who has been connected with the Ford organization for thirty-eight years, was chief engineer of the Willow Run bomber plant during World War II, and at the end of the war was appointed director of production engineering, later being named staff consultant to the department of manufacturing engineering.

BEAVER INDUSTRIES, 1500 W. Adams St., Chicago 7, Ill., has added a cold-heading department to its facilities for manufacturing screw machine products, and is installing new equipment for producing standard and special cold upset screws, studs, and rivets.

TOOL EQUIPMENT CO., 24 S. Pulaski Road, Chicago 24, Ill., has been appointed sales representative in Illinois, Wisconsin, Iowa, and northern Indiana for the BARTH STAMPING & MACHINE WORKS, INC., Cleveland, Ohio, manufacturer of tools, dies, gages, and metal stampings.

BERTRAM V. JONES has been appointed advertising manager of the Link-Belt Co., Chicago, Ill., succeeding Julius S. Holl, who died recently.

KEN MILLER has been appointed Fort Wayne representative for the J. N. Fauver Co., Inc., Detroit, Mich., serving northern Indiana and south central Michigan.

Michigan

CARBOLOY COMPANY, INC., Detroit, Mich., has announced the following appointments: I. L. WALLACE, formerly superintendent of the Carbide Metal Division, has been named manager of engineering for both carbide and other special metals; J. A. MULDOON, superintendent of the Carbide Fabricating Division, has been advanced to manager of manufacturing for carbides and other special metals; R. L. BROWNLEE, production manager on carbides, will act in the same capacity for other special metals; and F. C. RITNER, vice-president in charge of research, will take on additional duties, assisting E. F. WAMBOLD, executive vice-president, in a general administrative capacity.

HARRY J. SWANSON, Grand Rapids, Mich., has formed his own machine tool sales firm, known as the SWANSON MACHINERY CO., with headquarters at 1422 Lake Drive, S.E., Grand Rapids 6. Mr. Swanson served for ten years as district manager in charge of sales in western Michigan and northern Indiana for the E. L. Essley Machinery Co. of Chicago. Prior to that, he was engaged for sixteen years in manufacturing precision hardened and ground parts, while still earlier years were spent at Detroit, where he developed the Detroit centerless grinder.

C. E. WILLIS has been appointed chief engineer of Lear, Inc., Grand Rapids, Mich., manufacturer of electro-mechanical aircraft actuating and control equipment, industrial pumps and valves, etc. He succeeds R. A. RUGGE, who recently resigned.

WALTER DONNELLY has been appointed works manager of the Tomkins-Johnson Co., Jackson, Mich., manufacturer of air and hydraulic cylinders, riveters. clinchers. die-sinking milling cutters, and air control equipment.

WATERSTON'S, Detroit, Mich., manufacturer and distributor of tools and machinery, has recently completed a new building at 960 W. Eight Mile Road, two blocks east of Livernois Ave.

ROTO-FINISH CO., Kalamazoo, Mich., is completing the construction of an addition to its plant, which will greatly increase the manufacturing facilities of the company.

LEO P. GAJDA has been made chief engineer of the Arthur Colton Co. Division of the Snyder Tool & Engineering Co., Detroit, Mich., and

Leo P. Gajda, who has just been made chief engineer of the Arthur Colton Co.

SUNVIS H.D. 700 OILS PREVENT AND CURE "THROMBOSIS" IN PRODUCTION MACHINERY

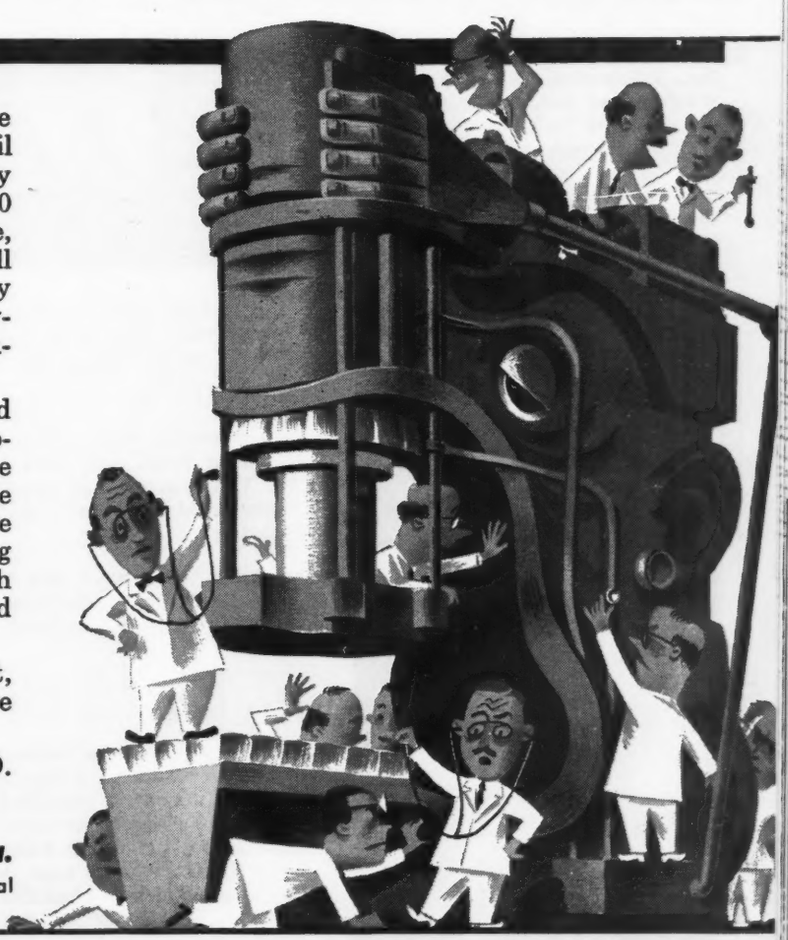
Reduced output and extra maintenance cost are the penalties when clogging occurs in the oil circulating system of machinery. But this costly production ill can be avoided. Sunvis H.D. 700 Oils *keep circulating systems clean*. What's more, if trouble exists now, Sunvis H.D. 700 Oils will *free oil lines and bearings of foreign matter*. They go to work immediately loosening up and carrying away any accumulation of dirt, carbon, water, or other contaminants.

Sunvis H.D. 700 Oils are specially developed for modern circulating systems on machines operating where contamination is a troublesome factor. Sunvis H.D. 700 Oils are extremely stable and have long life even under the most adverse conditions. They have inherent rustproofing characteristics, and the high film strength needed to eliminate scoring on heavily loaded antifriction type bearings.

Sunvis H.D. 700 Oils are also fully detergent, dispersive, and resistant to foaming, and are available in all required viscosities.

For further information about Sunvis H.D. 700 Oils, write for booklet M-12.

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
In Canada: Sun Oil Company, Ltd., Toronto and Montreal



SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO®

CECIL EDGAR has been named chief draftsman. The Colton division manufactures packaging machinery and plastic and powder metal presses. Mr. Gajda also holds the position of chief engineer of the Snyder organization.

HERBERT W. ROUSHKOLB has been made district manager of the Cleveland Automatic Machine Co.'s Detroit office, located at 540 New Center Bldg., Detroit 2, Mich.

New England

GRANT J. CASSERLY and DAVID R. FALVEY have been appointed field engineers in the combined territories of New England and northeastern New York State for the Allison Co., Bridgeport, Conn., manufacturer of abrasive cutting wheels.

RAYMOND T. PORTER has been appointed eastern sales manager of the Heppenstall Co., Pittsburgh, Pa., manufacturer of forgings, shear knives, and die-blocks. His headquarters will be at Bridgeport, Conn.

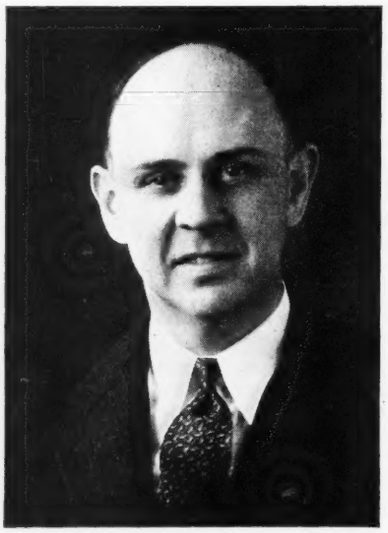
C. I. BRADFORD has been appointed director of operations of the newly formed concern, Rem-Cru Titanium, Inc., Bridgeport, Conn. EDWARD L. WEMPLE has been made production manager and DR. WALTER L. FINLAY research manager.

FRANK U. HAYES, sales manager of the Bullard Co., Bridgeport, Conn., has been elected a director of the company to succeed E. P. BLANCHARD, formerly director of sales, who recently retired upon the completion of thirty years of service with the company. Mr. Hayes joined the company in 1935, and has been connected with the sales organization ever since, with the exception of one year during the war period, when he served the Government as technical advisor to the Tool Section of the Production Division of the Office of Production Management.

Frank U. Hayes, recently elected director of the Bullard Co.

W. P. KIRK retired on October 31 as vice-president of Pratt & Whitney Division Niles-Bement-Pond Co., of Hartford, Conn. Mr. Kirk has not yet announced his future plans. Until further notice, he can be addressed at his residence, 60 Beverly Road, West Hartford, Conn.

ROBERT G. VAN KEUREN has been appointed chief sales engineer for the Abrasive Division of the Norton Co., Worcester, Mass., succeeding A. OAKLEIGH BUSH, who died recently. Mr. Van Keuren was previously a section head in the sales engineering department.



Robert G. Van Keuren, newly appointed chief sales engineer for the Norton Co.

WALTER F. GARLOW has been appointed sales promotion manager of the Howe Scale Co., Rutland, Vt.

New Jersey

WILLIAM R. STAPLES, formerly West Coast representative of the Carpenter Steel Co., has been appointed assistant to the manager of sales of the Alloy Tube Division at Union, N. J. PAUL E. KELLY takes over the West Coast duties formerly handled by Mr. Staples.

RAYBESTOS-MANHATTAN, INC., MANHATTAN RUBBER DIVISION, Passaic, N. J., announces the following sales promotions: JOHN T. M. FREY has been made assistant manager of the New York branch, and LAMAR S. HILTON assistant sales manager of the Abrasive Wheel Department.

HOBSITE PRODUCTS CO., INC., Paterson, N. J., manufacturer of "Keldur" vibration isolation sheet material, has moved its offices to 308 Sussex St., Harrison, N. J.

WILLIAM C. LILLIENDAHL has been appointed research advisory engineer for the Lamp Division of the Westinghouse Electric Corporation, Bloomfield, N. J.

VOLCO BRASS & COPPER CO., Kenilworth, N. J., announces the removal of its general sales office to 11 Commerce St., Newark 2, N. J.

New York

DOEHLER-JARVIS CORPORATION, New York City, has announced the following changes in personnel: CHARLES PACK, formerly vice-president in charge of production, has been named vice-president in charge of the newly formed Engineering and Research Department; W. G. GUTMUELLER, previously vice-president and secretary, has been named vice-president and production manager; LOUIS MILLER, director of labor relations, has been appointed assistant vice-president of the corporation; and HAROLD L. SAMUELS, formerly assistant secretary, has been named secretary of the organization, and is succeeded by H. C. MANDEVILLE.

A. ALVEN has been made general sales manager of the Lipe-Rollway Corporation, Syracuse, N. Y., manufacturer of machine tools, bar feeds, hacksaws, and clutches. Mr. Alven has held a similar position with the New York branch.

A. Alven, recently appointed general sales manager of the Lipe-Rollway Corporation

RELATIVE FORMABILITY AND COST, STRENGTH, AND ELONGATION OF ALUMINUM ALLOYS

Alloy and Temper	Forming Classification	Shear Strength, Pounds per Sq. In.	Yield Strength, Pounds per Sq. In.	Ultimate Tensile Strength, Pounds per Sq. In.	Elongation, Per Cent	Cost Classification
2S–O	Class I	9500	5000	13,000	35	Class I
3S–O	Class I	11,000	6000	16,000	30	Class I
4S–O	Class III	16,000	10,000	26,000	20	Class III
C50S–O	Class I	15,000	9000	22,000	25	Class II
52S–O	Class II	18,000	13,000	28,000	25	Class V
61S–O	Class II	12,500	8000	18,000	22	Class III
24S–O	Class II	18,000	11,000	27,000	20	Class VI
R301–O	Class II	18,000	10,000	25,000	21	Class IV
75S–O	Class IV	22,000	15,000	33,000	17	Class VII
2S–H12	Class I	10,000	14,000	16,000	12	Class I
3S–H12	Class I	12,000	17,000	19,000	10	Class I
4S–H32	Class IV	17,000	22,000	31,000	10	Class III
C50S–H32	Class II	16,000	21,000	25,000	10	Class II
52S–H32	Class III	20,000	27,000	34,000	11	Class IV
2S–H14	Class I	11,000	16,000	18,000	9	Class I
3S–H14	Class II	14,000	19,000	22,000	8	Class I
4S–H34	Class IV	18,000	27,000	34,000	9	Class III
C50S–H34	Class II	17,000	24,000	28,000	9	Class II
52S–H34	Class III	21,000	31,000	37,000	9	Class IV
2S–H16	Class I	12,000	18,000	21,000	6	Class I
3S–H16	Class II	15,000	22,000	26,000	5	Class I
4S–H36	Class IV	20,000	31,000	37,000	5	Class III
C50S–H36	Class II	18,000	27,000	30,500	8	Class II
52S–H36	Class III	20,000	34,000	39,000	8	Class IV
61S–T4	Class II	24,000	21,000	35,000	22	Class V
2S–H18	Class I	13,000	22,000	24,000	5	Class I
3S–H18	Class II	16,000	26,000	29,000	4	Class I
4S–H38	Class IV	21,000	34,000	40,000	5	Class III
C50S–H38	Class II	19,000	29,000	32,500	7	Class II
52S–H38	Class III	24,000	36,000	41,000	7	Class IV
61S–T6	Class II	30,000	41,000	45,000	12	Class V
R301–T3	Class III	37,000	40,000	62,000	20	Class VI
24S–T3	Class I	41,000	48,000	69,000	18	Class I
75S–T6	Class II	49,000	72,000	82,000	11	Class II
R301–T6	Class I	41,000	60,000	68,000	12	Class I

Notes: All mechanical properties and elongation values are typical. Shear strength values for C50S tempers are unofficial. Mechanical properties of "F" tempers are not guaranteed; therefore these are intentionally omitted. Class I rated material has best formability in its respective group, Class II is next best, etc. Class I rated material under "Cost Classification" is the least expensive, Class II is the next cheapest, etc. Clad alloys are not listed. If considered, use the same "Forming Classification" as shown for the bare alloys having the same alloy symbol. Mechanical properties of clad alloys are slightly less than those of the same bare alloy. Elongation values are approximately the same.

MACHINERY'S Data Sheet No. 672, December, 1950

Compiled by E. V. Sharpnack
Development Engineer
Reynolds Metals Co.

RELATIVE STRENGTH AND STIFFNESS OF STRUCTURAL METALS SUBJECTED TO BENDING

Comparison Based on Rectangular Beams of Constant Width Made of S A E 1025 Steel and Having Minimum Yield Strengths

COMPARISON	MATERIAL	FORM	THICKNESS	STRENGTH	STIFFNESS	WEIGHT
EQUAL THICKNESS	SAE 1025 Steel		100	100	100	100
	SAE 4130 Steel	Heat Tr. Sht.	100	375	100	100
	Alum. 3S-H14	½ Hard Sht.	100	44	35	35
	61S-T4	Heat Tr. Sht.	100	44	35	35
	24S-T4	Ht. Tr. Shapes	100	111	35	35
	75S-T6	Heat Tr. Sht.	100	183	35	35
	Titanium*	Hot Rolled	100	324	52	57
	Mag. FS-1a	Annealed Sht.	100	43	22	23
	FS-1h	H.R. Sheet	100	73	22	23
	FS-1	Extruded Bar	100	50	22	23
	ZK60A	Extr. & Aged	100	82	22	23
	O-1HTA	Ht. Tr. & Aged	100	88	22	23
EQUAL STRENGTH	SAE 1025 Steel		100	100	100	100
	SAE 4130 Steel		52	100	14	52
	Alum. 3S-H14		150	100	120	52
	61S-T4		150	100	120	52
	24S-T4		95	100	30	33
	75S-T6		74	100	14	26
	Titanium*		56	100	9	32
	Mag. FS-1a		152	100	79	35
	FS-1h		117	100	36	27
	FS-1		142	100	64	33
	ZK60A		110	100	30	25
	O-1HTA		107	100	27	25
EQUAL STIFFNESS	SAE 1025 Steel		100	100	100	100
	SAE 4130 Steel		100	375	100	100
	Alum. 3S-H14		141	88	100	49
	61S-T4		141	88	100	49
	24S-T4		141	221	100	49
	75S-T6		141	364	100	49
	Titanium*		125	506	100	71
	Mag. FS-1a		165	117	100	38
	FS-1h		165	200	100	38
	FS-1		165	136	100	38
	ZK60A		165	222	100	38
	O-1HTA		165	238	100	38
EQUAL WEIGHT	SAE 1025 Steel		100	100	100	100
	SAE 4130 Steel		100	375	100	100
	Alum. 3S-H14		285	358	819	100
	61S-T4		285	358	819	100
	24S-T4		285	904	819	100
	75S-T6		285	1490	819	100
	Titanium*		175	992	277	100
	Mag. FS-1a		439	831	1890	100
	FS-1h		439	1420	1890	100
	FS-1		439	965	1890	100
	ZK60A		439	1580	1890	100
	O-1HTA		439	1700	1890	100

*Titanium Alloy—10.0 Mo.; bal. Ti.+C.

MACHINERY'S Data Sheet No. 671, December, 1950

Compiled by Brooks & Perkins, Inc.

ADD FLEXIBILITY TO YOUR SURFACE GRINDERS WITH

EX-CELL-O

PRECISION SPINDLES

Ex-Cell-O 1 horsepower, 3600 rpm inbuilt motor spindle for surface grinder. Spindle swivels vertically, is used for sharpening cutters and broaches.

Standard horizontal Ex-Cell-O Precision Spindle with 1 horsepower, 3600 rpm inbuilt motor for surface grinders. Standard Ex-Cell-O belt-driven spindles also are available for this type of grinder.

This Ex-Cell-O High Speed Attachment drives small wheels at 18,000 rpm. It is driven by the standard motorized spindle and is supported by the standard spindle or spindle bracket.

You can add to the flexibility of your surface grinders, and perhaps save the cost of another machine, with Ex-Cell-O spindle equipment. For instance the large photo at left shows an inbuilt motor spindle that swivels vertically. It makes a standard surface grinder suitable for sharpening cutters and broaches. A mounting member extends through bore in column that ordinarily houses the standard horizontal spindle.

The Ex-Cell-O High Speed Attachment also adds to the flexibility of surface grinders. This attachment mounts on the standard horizontal spindle or spindle bracket. The standard surface grinding wheel is replaced by a pulley that, through a flat belt, drives the high speed spindle at 18,000 rpm. Thus, small wheels can be driven at an efficient speed for grinding small shoulders, slots and other hard-to-reach places.

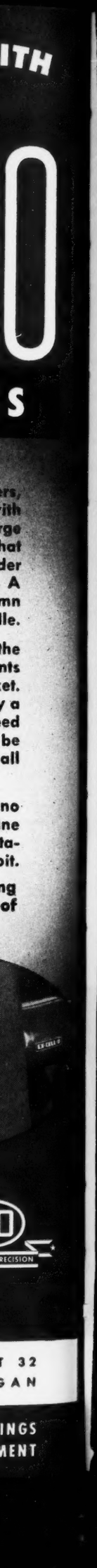
For rigid, smooth-running spindles that require no further lubrication or adjustment, and produce fine work day after day, contact your Ex-Cell-O representative or write to Ex-Cell-O Corporation in Detroit.

Send today for Ex-Cell-O's free Precision Grinding Spindle Catalog, Number 25962. No obligation, of course. Just use your company letterhead.

EX-CELL-O CORPORATION

DETROIT 32
MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT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Rollway Bearing Co., Inc., a subsidiary of the Lipe-Rollway Corporation for the last year and a half. He will also continue in this capacity.

J. T. FARRELL has been named assistant to the manager of sales of the Small and Medium Motor Divisions of the General Electric Co., Schenectady, N. Y. Other appointments include those of HOWARD W. BENNETT and PAUL D. ROSS, respectively, as managers of the new Gear-Motor and Packaged Drive Sales Division and the Erie, Pa., Direct-Current Armored Motor Sales Division.

WILLIAM T. KELLY, JR., has been appointed president of the American Brakeblok Division of the American Brake Shoe Co., New York City. In addition to filling his new duties, Mr. Kelly will continue to serve as president of the Kellogg Division, manufacturer of air compressors and paint spray equipment.

TEXAS CO., with headquarters at New York City, announces that a research expansion program has recently been completed at the company's Beacon, N. Y., laboratories. The new building affords 55,000 square feet of added research area and increases the facilities by approximately 40 per cent.

SIMMONS MACHINE TOOL CORPORATION, 50 E. 42nd St., New York 17, N. Y., has been named exclusive overseas distributor for the line of metalworking machinery made by KLING BROTHERS ENGINEERING WORKS, Chicago, Ill., which includes bending and shearing equipment, punches, grinders, friction saws, etc.

HOWARD COOPER, manager of technical service for the Sinclair Refining Co., New York City, was elected president of the National Lubricating Grease Institute at the annual meeting held in October.

RICHARDSON - ALLEN CORPORATION, manufacturer of direct-current power conversion equipment, announces the removal of its offices and manufacturing facilities to a new plant at 116-15 Fifteenth Ave., College Point, Long Island, N. Y.

RUSSELL, HOLBROOK & HENDERSON, INC., 292 Madison Ave., New York 17, N. Y., have been appointed American representatives of MIKRON, S.A., Bienne, Switzerland, manufacturer of precision gear-hobbing machines for producing gears and worms.

THOMAS R. HUGHES has been appointed vice-president and sales manager of the Utica Drop Forge & Tool Corporation, Utica, N. Y. Mr. Hughes has been connected with the company since 1940, and has held positions both in the manufacturing and sales ends of the business.

HAUSER MACHINE TOOL CORPORATION, 30 Park Ave., Manhasset, N. Y., announces that it has now available for shipment U. S. stocks of the keyless self-centering drill chuck manufactured by Leo Hjort Co. of Copenhagen, Denmark.

AUSTIN C. ROSS, manager of the Buffalo works of the Worthington Pump & Machinery Corporation, has been elected a vice-president of the company. He will continue to serve as Buffalo works manager.

EDMUND A. WATSON has been appointed assistant to vice-president of the American Car & Foundry Co., New York City. He will be engaged in the manufacturing activities of the production department.

WAYNE BELDEN has been elected executive vice-president of the Ajax Flexible Coupling Co., Inc., Westfield, N. Y. CHARLES BELDEN has been made vice-president, and ROBERT G. CADY sales manager.

GORDON PORTERFIELD has returned to the New York office of the Baldwin Locomotive Works as sales representative for hydraulic presses, power tools, hydraulic turbines, and Pelton products.

Ohio

DOEHLER-JARVIS CORPORATION, with headquarters at 386 Fourth Ave., New York 16, N. Y., announces an extensive expansion program for its Toledo, Ohio, plant No. 2, which is expected to be completed soon. The new plant will have a floor space of 211,495 square feet, and approximately 1000 employes will be needed for normal operation. One of the outstanding features of the new building is that it is laid out and constructed especially to accommodate the increasing size of die-castings. The company is also building a die-casting plant in Grand Rapids, Mich., and has purchased property for the erection of another factory at Pottstown, Pa.

MEAD L. BRICKER, former vice-president and a member of the Administration Committee of the Ford Motor Co., has been elected a member of the board of directors of the Federal Machine & Welder Co., Warren, Ohio. Mr. Bricker is also a director of the Ford Motor Co.

CLEVELAND TRAMRAIL DIVISION of the CLEVELAND CRANE & ENGINEERING Co., Wickliffe, Ohio, announces the

Howard Cooper, newly elected president of National Lubricating Grease Institute

(Left) Robert F. Golden, whose appointment as works manager for the Reliance Division, Eaton Mfg. Co., Massillon, Ohio, was recently announced (Right) C. A. Sellen, assistant to the general manager

appointment of the following representatives: MATERIAL HANDLING EQUIPMENT CO., 30 Church St., New York 7, N. Y.; JOHN W. and WILLIAM H. CARLSON, 23 North Ave., N. W., Atlanta 3, Ga.; and CLEVELAND TRAMRAIL CALIFORNIA CO., 4700 District Blvd., Los Angeles 58, Calif. Announcement is also made that the San Francisco office of the Cleveland Tramrail California Co. has moved to 503 Market St., San Francisco 5.

WILLARD F. ROCKWELL, chairman of the board of the Rockwell Mfg. Co., Pittsburgh, Pa., has been elected a member of the board of directors of the E. W. Bliss Co., Canton, Ohio, manufacturer of presses, rolling mills, and container machinery, and LUCIEN R. COLLART has been elected secretary and treasurer of the company.

OHIO ELECTRIC MFG. CO., Cleveland, Ohio, announces the purchase of all tools, dies, fixtures, patents, and manufacturing rights for the complete line of drilling machine previously made by the Taylor & Fenn Co., Hartford, Conn. The Taylor & Fenn line will be manufactured at the Ohio plant.

E. W. BLISS CO., Canton, Ohio, announces an arrangement with JOHN BERTRAM & SONS CO., LTD., Dundas, Ontario, Canada, by means of which this company will build the complete line of Bliss mechanical presses, in addition to its own line of special machine tools.

OHIO EQUIPMENT CO. has moved into larger quarters at 1220 W. 9th St., Cleveland 13, Ohio. The company is representative of the Economy Engineering Co., manufacturer of portable elevators, tiering machines, and storage racks.

STERLING ELECTRIC MOTORS, INC. announces the acquisition of an eleven-acre site in Van Wert, Ohio, on which it is planned to construct a branch plant to serve the company's midwestern and eastern business.

PRODUCTO MACHINE CO., Bridgeport, Conn., manufacturer of die sets and other tool- and die-maker's supplies, announces the opening of a new warehouse and assembly plant at 3632 Delphos Ave., Dayton 7, Ohio.

HERBERT J. WERNER has joined the Columbia Machinery & Engineering Corporation, Hamilton, Ohio, as chief engineer of the mechanical press division.

DIE SUPPLY CO., formerly located at 5349 St. Clair Ave., Cleveland, Ohio, has recently moved into a new $200,000 plant at 1400 Brookpark Road.

C. R. BROWN has been appointed purchasing manager for the new Canton, Ohio, Division of the E. W. Bliss Co.

Richard H. DeMott, new president of S K F Industries, Inc.

Pennsylvania

RICHARD H. DEMOTT has been made president of the S K F Industries, Inc., Philadelphia, Pa., succeeding WILLIAM L. BATT, who recently retired to become chief of the Economic Cooperation Administration mission to the United Kingdom. Mr. DeMott has been connected with the company for thirty-five years. Starting as a salesman, he was made general sales manager in 1928, and became vice-president in charge of sales in 1943. Through his efforts, anti-friction-bearings have been introduced into many new fields, and the industrial use of these bearings has steadily broadened. During World War II, he was in charge of all negotiations for the building of a government-owned plant at North Wales, Pa., for the manufacture of aircraft bearings. He is executive vice-president of the Exhibitors Advisory Council, president of the Sales Managers Association of Philadelphia, and chairman of the Defense Committee of the Anti-Friction Bearing Manufacturers Association.

BALDWIN LOCOMOTIVE WORKS, Philadelphia, Pa., and LIMA-HAMILTON CORPORATION, New York City, have announced a plan of reorganization whereby Baldwin Locomotive Works will change its name to BALDWIN-LIMA-HAMILTON CORPORATION and acquire all the Lima-Hamilton assets in exchange for stock of Baldwin-Lima-Hamilton.

H. STURGIS POTTER has been appointed general sales manager of the Carpenter Steel Co., Reading, Pa., to succeed R. V. MANN, who until his recent death was vice-president in charge of sales. Mr. Potter became connected with the company in 1936 as a sales engineer in the Indianapolis territory, and held this position until 1941, when he was appointed assistant manager of tool steel sales in the Reading office. In 1947, he was promoted to the position of manager of tool sales, and in 1948 was made sales manager in charge of Reading mill products. His responsibilities are now extended to take in the entire domestic and foreign sales organization.

LAWRENCE L. GARBER has been appointed general manager of the American Fort Pitt Spring Division of the H. K. Porter Co., Inc., McKees Rocks, Pa. Announcement has also been made that B. C. BLAKE has been appointed vice-president and general manager of the Connors Steel Co. Division of the company in Birmingham, Ala.

E. C. BARLOW has become affiliated with Charles J. Hass, Inc., Philadelphia, Pa., manufacturer of industrial chemicals, oils, and greases. Mr. Barlow was for twenty-four years sales manager for the Central Division of E. F. Houghton & Co.

L. R. LUDWIG has been made assistant to the vice-president of the Westinghouse Electric Corporation, Pittsburgh, Pa. He was previously in charge of operations at the Buffalo Works.

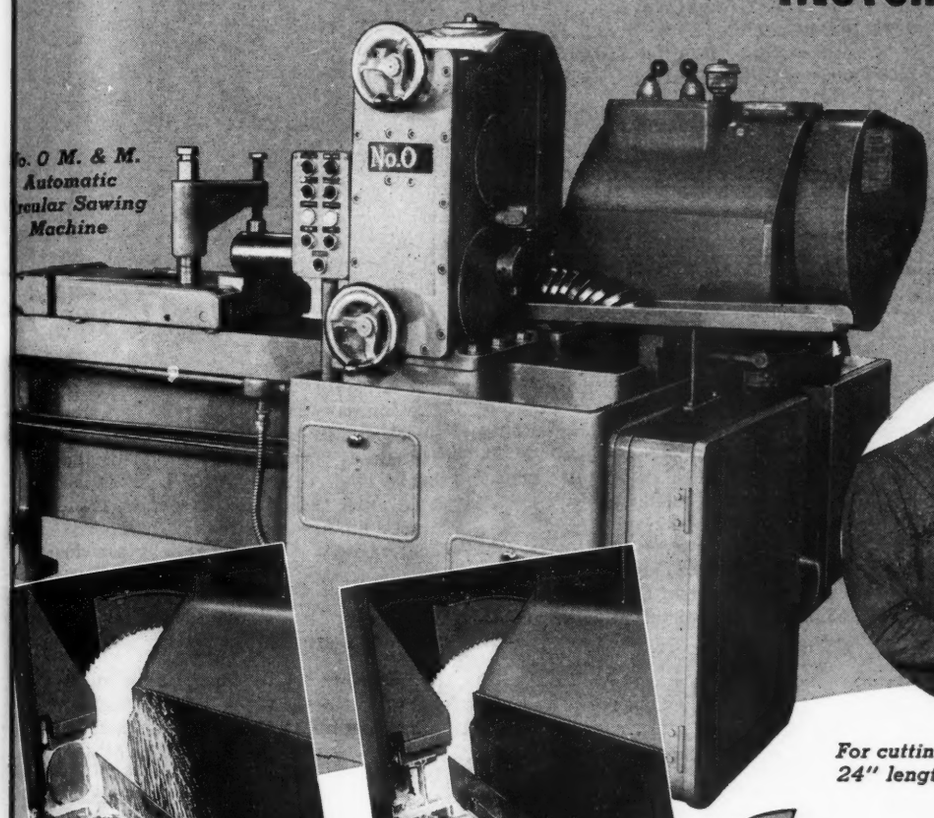
H. K. PORTER CO., INC., Pittsburgh, Pa., announces that it has acquired the CONNORS STEEL CO., INC., Birmingham, Ala., manufacturer of electric furnace steel and steel products.

STUART H. SMITH has been appointed manager of industrial development and JOHN H. TIPTON Cincinnati district manager for S K F Industries, Inc., Philadelphia, Pa.

H. Sturgis Potter, recently appointed general sales manager of Carpenter Steel Co.

PRODUCTION .. the Call of the Hour!

GET IT WITH MOTCH & MERRYWEATHER *Automatic* Circular Sawing Machines!



o. 0 M. & M. Automatic rcular Sawing Machine

For cutting off ferrous or non-ferrous stock up to 24" length and 4" diameter, round or square.

Material . . . . . SAE 1020
Size . . . . . 4" dia.
Sawing Time . . . . 50 seconds

Material . . . . . SAE 1020
Size . . . . . 3" I-Beam
Sawing Time . . . . 22 seconds

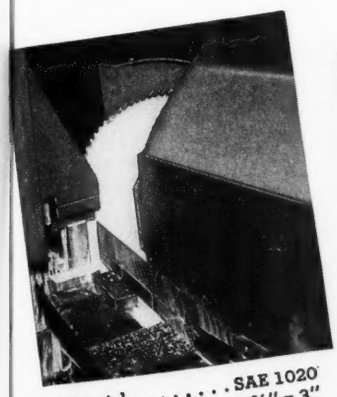
SPEED • ACCURACY • SQUARE ENDS • LOW COST

Higher production lowers your cost per cut-off piece, together with extreme accuracy which eliminates many second operations. This little giant of production will save you money in tool costs and get your work out faster.

Investigate! Ask for Bulletin No. 150-M.

★ ★ ★

Look to Motch and Merryweather for production cut-off machines handling stock from ¼" through 18" diameter, as well as machines for special applications, including sawing with simultaneous second operations. M. & M. builds circular sawing machines, automatic saw sharpeners and circular saw blades, transfer and special machines.



Material . . . . . SAE 1020
Size . . . . . 1-¾" x 3"
Sawing Time . . . . 20 seconds

Material . . . . . SAE 1020
Size . . . . 3" O.D. x ⅜" wall
Sawing Time . . . . 28 seconds

Manufactured by

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
715 PENTON BUILDING • CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Automatic and Special Machines

RODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

John W. Thompson, recently appointed product manager of the Carpenter Steel Co.

JOHN W. THOMPSON has been appointed product manager of the Carpenter Steel Co., Reading, Pa. In his new position, he will supervise stainless, alloy, and tool steel sales, and will continue to be responsible for product development, advertising, and marketing. He was formerly manager of sales development.

Tennessee

PAUL E. CRAFTON has been appointed Chattanooga district sales engineer for the F. J. Evans Engineering Co., Birmingham, Ala. He will specialize in the sale of Surface Combustion Corporation's heat-treating furnaces and burners and the Webster Engineering Co.'s industrial burner equipment. His headquarters will be at 3808 Mission View, Chattanooga, Tenn.

KANO LABORATORIES, manufacturers of industrial oils and rustproofing compounds, announce their removal from Chicago to a new plant at 1000 S. Thompson Lane, Nashville 11, Tenn., which provides four times as much space as the former quarters.

WESTCOTT CHUCK CO., Oneida, N. Y., has appointed JOHN T. EVERETT & CO., 606 M & M Bldg., Memphis, Tenn., district representative of the company in Alabama, Arkansas, Oklahoma, Louisiana, Mississippi, and Texas.

Wisconsin and Minnesota

JOHN A. EVANS has purchased the KENWORTH METAL STAMPING CO., 3455 N. Holton St., Milwaukee 12, Wis., which is equipped for large-volume metal stamping production work and specializes in short-run stampings from temporary dies. The owner, Mr. Evans, becomes president and treasurer, and the present production personnel will be retained.

MILWAUKEE DIE CASTING CO. has started the erection of a new plant on North Holton St., Milwaukee, Wis., which will contain a total of 44,000 square feet of floor space, 36,000 of which will be used for the production facilities, located all on one floor.

PAUL W. WAHLER has been made service manager of the Twin Disc Clutch Co., Racine. Wis., and ROBERT A. HARMON has been named dealer sales supervisor.

E. J. RATHSACK has been appointed secretary and engineer in charge of production for the Kenworth Metal Stamping Co., Milwaukee, Wis.

RELTOOL CORPORATION, 4540 W. Burnham St., Milwaukee, Wis., manufacturer of "Reliable" metal cutting tools, has appointed the LYMAN B. WARREN CO., St. Paul, Minn., representative of the company.

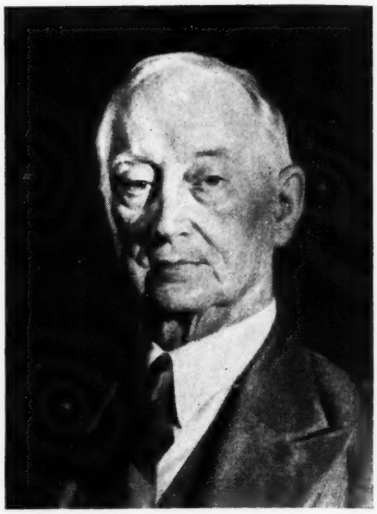
CLECO DIVISION OF REED ROLLER BIT CO., Houston, Tex., has appointed the GRANITE CITY TOOL CO., Box 368, St. Cloud, Minn., distributor of Cleco pneumatic tools.

Obituaries

Lewis John Firth

Lewis John Firth, a pioneer in the tool steel industry, died on November 3 in Pittsburgh following a prolonged illness. Mr. Firth was born in England in 1858, and at the age of sixteen entered the employ of Thomas Firth & Sons Ltd., Sheffield, a business founded by his grandfather in 1840. He became a director in 1881, and later was made joint managing director. In 1897, the parent company acquired control of the Sterling Steel Co., McKeesport, Pa., a small mill making quality tool steels, and the firm of Firth Sterling Steel Co. was established, with Mr. Firth as president.

Under his guidance, the new Firth Sterling Steel Co. was one of the first makers of high-speed steel; the first in the Pittsburgh area to adopt the electric furnace in place of crucible melting; made the first stainless steel in this country; installed the first electric induction furnace used in a tool steel mill; and more recently added the manufacture of tungsten carbide to the company's line, at which time the name of the company was changed to Firth Sterling Steel & Carbide Corporation.



Lewis John Firth

Mr. Firth remained president of the company until 1937, when he was succeeded by his son, L. Gerald Firth. He then became chairman of the board of directors, which position he held until 1944, when he retired from active business at the age of eighty-six, rounding out seventy years in the tool steel industry.

Julius S. Holl

Julius S. Holl, advertising manager of the Link-Belt Co., Chicago, Ill., for almost forty years, died at the Presbyterian Hospital in Chicago on October 24 after a prolonged illness. Mr. Holl was born in Philadelphia in 1886, and entered the employ of a subsidiary of the Link-Belt Co., the J. M. Dodge Co., Philadelphia, in 1905 as a stenographer and clerk. He was subsequently transferred to the parent company's plant in Philadelphia, and became advertising manager in 1911. Mr. Holl helped to or-

Julius S. Holl

THE MUSHROOM-LIKE OBJECT directly below is the completed assembly of the radio volume control shaft made by P. R. Mallory & Co., Inc., Indianapolis, Ind., (actual size). Photo below it shows the plastic part attached by a staking operation. This staking is shown in detail in photo of part enlarged 7 times, at right. Photo at bottom shows control shaft after machining and before staking. Shaft is made from Revere Alloy 247 . . . ¼" round free cutting brass rod.

BY SWITCHING TO REVERE FREE CUTTING BRASS ROD P. R. MALLORY & CO., INC.,

SAVES ON 2 COUNTS!

Staking operation on radio volume control shaft performed without fracture . . . annealing operation eliminated.

The solution to the Mallory Company's problem was not as easy as it might appear. It was not simply a case of Revere Technical Advisory Service recommending ¼" round, free cutting brass rod. That rod had to possess the machinability to match Mallory's existing production machine set-up and at the same time be sufficiently workable so that annealing, prior to staking, could be eliminated; and that staking be accomplished without fracturing the metal.

After consulting with the Mallory Engineers, and discussing the tests which Mallory would subsequently conduct, Revere recommended a ¼" round, half hard riveting and turning rod mixture 247. Working tests made by Mallory showed this rod to possess all the necessary requirements.

As a result of those tests, P. R. Mallory & Company is now using this Revere free cutting brass rod to its complete satisfaction for the radio volume control shafts it manufactures. Not just any ¼" brass rod, but the *right* rod made it possible for them to save on 2 counts.

Perhaps Revere has a brass, a copper or some special alloy to help you in the development or improvement of your product . . . in cutting your production costs. So why not tell Revere *your* metal problems? Call the Revere Sales Office nearest you today.

REVERE

COPPER & BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

ganize the National Industrial Advertisers Association and was a past-president of that Association.

ERNEST V. MONCRIEFF, former president of the Swan-Finch Oil Corporation, New York City, died on November 5 at the age of sixty. He had been connected with the Swan-Finch organization for thirty-five years, serving as president from 1930 to 1948. He was also a past-president of the National Lubricating Grease Institute, and had been its treasurer from 1934 until a month before his death.

ROY E. MAICHEL, St. Louis branch sales representative for the Berger Manufacturing Division of the Republic Steel Corporation, died on November 2, aged fifty-six years. Mr. Maichel had represented the Berger Sheet-Metal Building Products Division in the St. Louis area since he joined the firm in 1937.

FRANKLIN JOHNSTON, secretary and purchasing agent of the Moline Tool Co., Moline, Ill., died on November 12, at the age of seventy-two years, following an extended illness. He had not worked since May 23 of this year. Mr. Johnston had been associated with the company for forty years, having begun his employment on August 4, 1910.

GEORGE S. CASE, SR., chairman of the executive committee of Lamson & Sessions Co., Cleveland, Ohio, died on October 11 at the age of sixty-eight years. Mr. Case was president of the company from 1929 to 1938.

Coming Events

JANUARY 15-18 — Second annual PLANT MAINTENANCE SHOW at Cleveland, Ohio. Sponsored by the American Society of Mechanical Engineers and the Society for the Advancement of Management. For further information, address Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

MARCH 15-17—Annual meeting of the American Society of Tool Engineers at the Hotel New Yorker in New York City. Executive secretary, Harry E. Conrad, 10700 Puritan Ave., Detroit 21, Mich.

MARCH 19-23 — Seventh WESTERN METAL EXPOSITION AND CONGRESS in the Auditorium and Exposition Hall in Oakland, Calif. Sponsored by the American Society for Metals, in cooperation with twenty other national technical societies. Secretary, William H. Eisenman, Exposition Hall, 918 Fallon St., Oakland 7, Calif.

APRIL 17-20—TWENTIETH NATIONAL PACKAGING EXPOSITION sponsored by the AMERICAN MANAGEMENT ASSOCIATION at the Auditorium in Atlantic City, N. J. Public relations director, Edward K. Moss, 330 W. 42nd St., New York 18, N. Y.

APRIL 23-26—Fifty-fifth annual convention of AMERICAN FOUNDRYMEN'S SOCIETY in Buffalo, N. Y. Secretary-treasurer, William W. Maloney, 616 S. Michigan Ave., Chicago 5, Ill.

APRIL 30-MAY 4—FOURTH NATIONAL MATERIALS-HANDLING EXPOSITION in the International Amphitheatre, Chicago, Ill. Sponsored by the Materials Handling Institute. Further information can be obtained from the exposition management, Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

MAY 23-24—Fifth annual convention of the AMERICAN SOCIETY FOR QUALITY CONTROL in Cleveland, Ohio; headquarters, Hotel Cleveland. For further information, address John F. Occasione, Publicity Chairman, American Society for Quality Control, care of American Steel & Wire Co., 1406 Rockefeller Bldg., Cleveland 13, Ohio.

* * *

Business in Gearing Industry Continues to Increase

Business in the gearing industry continues in its upward trend. Reports from the American Gear Manufacturers Association for the month of September, 1950—the last month for which figures are available—showed an increase of 6 per cent, compared with the previous month. The index figure for September is computed to be 654.5 (1935-39 = 100).

* * *

One out of every five cars in use has been driven more than 80,000 miles, according to *Automobile Facts and Figures*.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946,

of MACHINERY, published monthly at New York 13, N. Y., for October 1, 1950.

State of New York } ss
County of New York }

Before me, a Notary Public in and for the state and county aforesaid, personally appeared Edgar A. Becker, who, having been duly sworn according to law, deposes and says he is business manager of The Industrial Press, Publishers of MACHINERY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations), printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editors, managing editor, and business managers are: Publisher, The Industrial Press, 148 Lafayette St., New York 13, N. Y.; Editor, Charles O. Herb; Consulting Editors, Erik Oberg and Franklin D. Jones; Business Managers, Robert B. Luchars, Edgar A. Becker, and Harold L. Gray. The address of all the foregoing is 148 Lafayette St., New York 13, N. Y.

2. That the owners of 1 per cent or more of the total amount of stock are: The Industrial Press, Robert B. Luchars, Edgar A. Becker, Franklin D. Jones, Walter E. Robinson, Charles O. Herb, Harold L. Gray, Clifford Strock, and Suno E. Larson, all of 148 Lafayette St., New York 13, N. Y.; Helena E. Oberg, 65 Eighty-second St., Brooklyn 9, N. Y.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt.; First National Bank & Trust Co. of Montclair and Robert B. Luchars, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair and Leigh Roy Urban, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair and Kenneth D. Ketchum, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; Lee W. Urban, Guardian for Susan Yarnall Urban, 27 Clinton St., Oneonta, N. Y.; Lee W. Urban, Executrix of Will of Robert L. Urban, 27 Clinton St., Oneonta, N. Y.; and John T. Urban, 224 Sullivan St., New York 12, N. Y.

3. That the known bondholders, mortgagees, and other security holders are: Charlotte B. Baldwin, 420 Clinton Ave., Brooklyn, N. Y.; Robert B. Luchars, John Connolly, Franklin D. Jones, and Louis Pelletier, all of 148 Lafayette St., New York 13, N. Y.; Elizabeth Y. Urban, 38 Lakeview Road, Asheville, N. C.; Helen L. Ketchum, 231 King St., Cohasset, Mass.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt.; and Henry V. Oberg, 3375 Kenmore Road, Shaker Heights 22, Ohio.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDGAR A. BECKER, Business Manager

Sworn to and subscribed before me this 29th day of September, 1950

(SEAL)

CHARLES P. ABEL
Notary Public, State of New York
No. 24-0002700
Qual. in Kings Co. Certs. filed with
N. Y. Co. Clerk, Kings & N. Y. Co. Registers
Term expires March 30, 1951